

# The Journal *of the* SOCIETY OF DYERS AND COLOURISTS

Volume 72    Number 1

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THE SOCIETY OF DYERS AND COLOURISTS  
19 PICCADILLY    BRADFORD 1    YORKSHIRE

## Notice to Authors of Papers

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion at the beginning of the paper. References to the literature should be numbered consecutively, using superscript numbers without brackets immediately following the text words or author's name to which they refer.

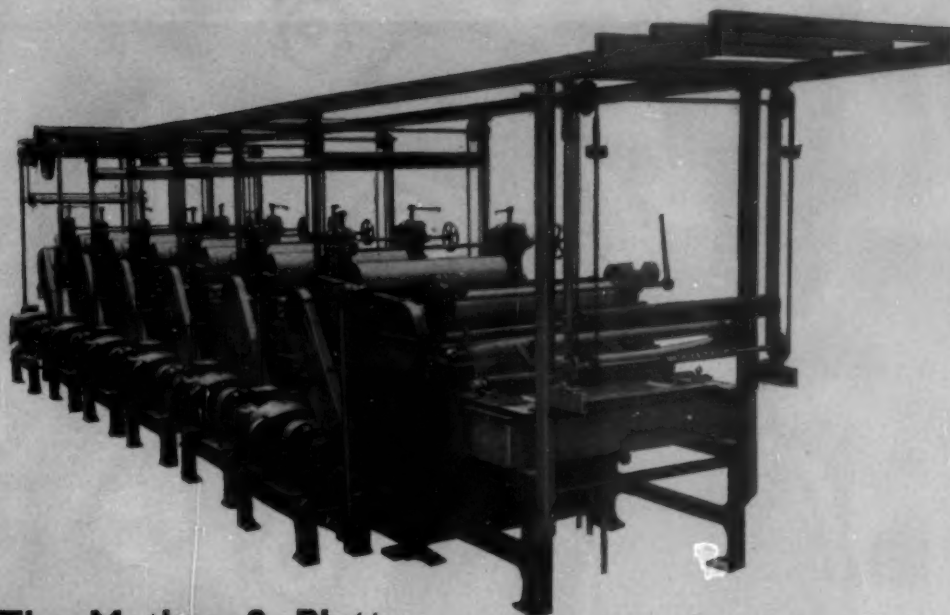
The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Jan. 1950 issue (p. 54) should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

Twenty-five free copies of a reprint are supplied to the author of an original paper published in the *Journal*, or fifty free copies are supplied when there are two or more authors, and a further number may be purchased from the Society at the rates given below.

### REPRINTS OF LECTURES AND COMMUNICATIONS

Reprints of all lectures and communications are available after publication to members and non-members of the Society. The charges (postage included) are as follows—Single copies 2s. 6d. each; per dozen copies up to and including 8 pages, 12s. 6d., and for papers occupying more than 8 pages of the *Journal*, 17s. Orders should be addressed to "The Society of Dyers and Colourists, 19 Piccadilly, Bradford 1". They can be accepted only if accompanied by remittance and if received immediately after publication of the paper.



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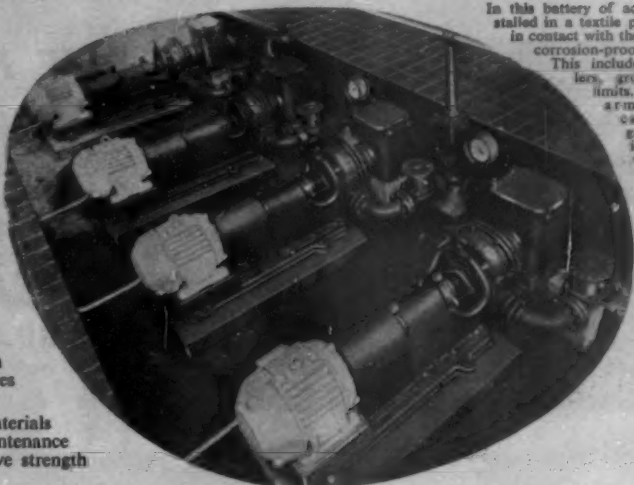


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*In 1856 William Henry Perkin discovered Mauveine. This historic event marked the birth of the dyestuffs industry and the greater part of the organic chemical industry of the world. From these small beginnings have sprung dyes and pharmaceuticals, textile and rubber chemicals, plastics and synthetic fibres, for Perkin's discovery turned organic chemistry from an academic study into a matter of world-wide industrial importance*

The Centenary will be celebrated by Lectures and Social Functions in London on  
Monday 7th May 1956

**Evening** Principal overseas guests will be entertained by representatives of the Councils of the sponsoring bodies at Tallow Chandlers' Hall in the City of London, prior to the opening of the Conference

**Tuesday 8th May**

**Afternoon** Opening paper on *The Life and Work of Perkin* will be read by Prof. John Read Ph.D M.A F.R.S

**Evening** A Reception for all those attending the Conference, and guests, at Guildhall in the City of London by kind permission of The Rt. Hon. The Lord Mayor of London

**Wednesday 9th May**

**Morning** A paper on *The Development of the Dyestuffs Industry* will be read by Clifford Paine Esq B.Sc

**Afternoon** A paper on *The Tinctorial Arts Today* will be read by J. G. Evans Esq M.Sc Tech

**Evening** A Banquet will be held at The Dorchester, Park Lane, London

**Thursday 10th May**

**Morning** A paper on *The Development of Organic Chemistry since Perkin's Discovery* will be read by Sir Alexander R Todd M.A D.Phil D.Sc LL.D F.R.S

All the papers will be read in the theatre of The Royal Institution, Albemarle Street, London W.1

The charges for those attending the Conference and other functions are  
Conference Registration Fee and Guildhall Reception 3 guineas, Banquet 3 guineas

There is available an inclusive charge of £5 10 0 for Registration, Reception and Banquet but the charge for an accompanying guest for the Banquet only is £3 3 0

Applications indicating desired ticket requirements for Banquet, Receptions and Lectures should be sent AT ONCE to the General Secretary and please state whether you will be accompanied by a lady when attending the Banquet and Receptions

## The Journal of the Society of Dyers and Colourists

(Subscription rates for non-members £4 per annum, post free)

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### NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring general information regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1-6 of the January 1956 and pages 369-373 of the July 1955 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (Telephone Bradford 25138-9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

### Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

#### LECTURES

The Classification of Dyes by their Dyeing Characteristics

*W. Beal*

Some Properties of Anthraquinone Dyes

*R. H. Peters and H. H. Sumner*

#### F.T.C.C. PUBLICATION

The Spectral Regions of Daylight which cause Fading

*K. McLaren*

#### COMMUNICATIONS

The Dyeing of Acetate Rayon with Disperse Dyes

V—Diffusion Coefficients in Cellulose Acetate Film *C. L. Bird, F. Manchester, and D. T. Scott*

The Polarography of Azo Dyes

*J. de O. Cabral and H. A. Turner*

The Dyeing of Cellulose Acetate with Non-ionic Dyes

III—Dyeing from the Vapour Phase

*T. G. Majury*

### THE SOCIETY OF DYERS AND COLOURISTS

## ASSOCIATESHIP EXAMINATIONS 1956

The next Associateship Examinations

will be held on **Thursday, Friday and Saturday, 14, 15 and 16 June 1956.**

Closing date for receipt of candidates' applications **31 March 1956**

#### THE

### THIRTEENTH MERCER LECTURE

will be held in

**Glasgow on Friday 13th April 1956**

**R. K. FOURNESS Esq**

**B.Sc F.R.I.C F.S.D.C**

will lecture on "Disperse Dyes—  
their Development and Application"

#### THE

### FOURTH LONDON LECTURE

will be held on **Friday 20th April 1956**

at the **Waldorf Hotel, London, W C 2**

**at 7 p m**

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## FORTHCOMING MEETINGS OF THE SOCIETY

**Tuesday, 24th January 1956**

LEEDS JUNIOR BRANCH. *Fading—Its Nature and Assessment*. H. B. Mann, Esq. (Messrs. Courtaulds Ltd.). The Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, Leeds 2. 3.30 p.m.

**Thursday, 26th January 1956**

WEST RIDING SECTION. *Textile Invention and the Dry Cleaner*. A. J. Crockett, Esq., M.Sc., F.R.I.C. (Messrs. Eastmans). The Hotel Metropole, King Street, Leeds. 7.30 p.m.

**Monday, 30th January 1956**

BRADFORD JUNIOR BRANCH. *A New Approach to High Temperature Dyeing*. S. N. Bradshaw, Esq. (Courtaulds Coventry Ltd.). Technical College, Bradford. 7.15 p.m.

**Thursday, 2nd February 1956**

SCOTTISH SECTION. *Scouring and Milling*. B. F. J. Moxon, Esq. (Wool Industries Research Association). The Scottish Woollen Technical College, Galashiels. 7 p.m.

**Friday, 3rd February 1956**

LONDON SECTION. *A New Approach to High Temperature Dyeing*. S. N. Bradshaw, Esq. (Courtaulds Ltd., Coventry). Royal Society Rooms, Burlington House, Piccadilly, London, W.1. 6 p.m.

**Tuesday, 7th February 1956**

LEEDS JUNIOR BRANCH. *A New Approach to High Temperature Dyeing*. S. N. Bradshaw, Esq. (Messrs. Courtaulds Ltd.). The Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, Leeds 2. 3.30 p.m.

**Wednesday, 8th February 1956**

NORTHERN IRELAND SECTION. *General Principles in Vat Dyeing*. J. W. Reidy, Esq. (Messrs. L. B. Holliday & Co. Ltd.). Thompson's Restaurant, Donegall Place, Belfast. 7.30 p.m.

**Thursday, 9th February 1956**

WEST RIDING SECTION. *The Dyeing and Finishing of 'Terylene' and 'Terylene/Wool Blended Fabrics'*. H. R. Hadfield, Esq., M.Sc.Tech. and G. D. Myers, Esq., M.Sc.Tech. (Imperial Chemical Industries Limited, Dyestuffs Div., and Terylene Council). The Victoria Hotel, Bridge Street, Bradford. 7.30 p.m.

**Tuesday, 14th February 1956**

SCOTTISH SECTION. *The Dyeing and Finishing of 'Terylene' and 'Terylene' Blends*. J. G. Graham, Esq., and Dr. P. T. Standing (I.C.I. 'Terylene' Council). St. Enoch's Hotel, Glasgow. 7 p.m.

**Wednesday, 15th February 1956**

BRADFORD JUNIOR BRANCH. *Piece Scouring*. B. F. J. Moxon, Esq. (Wool Industries Research Association). Technical College, Bradford. 7.15 p.m.

**Friday, 17th February 1956**

MANCHESTER SECTION. *A New Approach to High Temperature Dyeing*. S. N. Bradshaw, Esq., B.Sc. Textile Institute, 10 Blackfriars Street, Manchester 10. 6.30 p.m.

NORTHERN IRELAND SECTION. Dinner Dance. Details later, at Woodbourne House Hotel.

**Saturday, 18th February 1956**

MANCHESTER SECTION. Perkin Centenary Ball. It is proposed to hold a Dinner Dance at the Midland Hotel, Manchester on this date.

**Monday, 20th February 1956**

HUDDERSFIELD SECTION. *The Finishing of 'Terylene' and 'Terylene' Wool Blended Fabrics*. N. M. Mims, Esq., B.A., B.Sc. (Joint Lecture with the Huddersfield Textile Society). Large Hall, Technical College, Huddersfield. 7.30 p.m.

**Thursday, 23rd February 1956**

MIDLANDS SECTION. *The Finishing of 'Terylene' and 'Terylene/Wool Blends'*. I. E. Haden, Esq., B.Sc., and B. I. Brooke, Esq., B.A.(Oxon.). Gas Theatre, Nottingham. 7 p.m.

NORTHERN IRELAND SECTION. *Film Evening*. Thompson's Restaurant, Donegall Place, Belfast. (Joint Meeting with the Textile Institute.) 7.30 p.m.

WEST RIDING SECTION. *Progress in the Cibalan Dye Range and their Application*. Clayton Dyestuffs Co. Ltd. Lecturer details later. The Victoria Hotel, Bridge Street, Bradford. 7.30 p.m.

**Friday, 2nd March 1956**

LONDON SECTION. *Basic Mechanisms of Fading of Dyed Textiles*. H. B. Mann, Esq. (Courtaulds Ltd., Bocking). Royal Society Rooms, Burlington House, Piccadilly, London, W.1. 6 p.m.

BRADFORD JUNIOR BRANCH. Annual Dance. Connaught Rooms, Bradford.

**Tuesday, 6th March 1956**

LEEDS JUNIOR BRANCH. *The Textile Technologist in the Hosiery Trade*. F. M. Stevenson, Esq., M.Sc., J.P. (Messrs. Stevensons (Dyers) Ltd., Ambergate, Derbyshire). The Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, Leeds 2. 3.30 p.m.

**Thursday, 8th March 1956**

WEST RIDING SECTION. *A Commentary on the Use of Colour in Wool*. S. Morse-Brown, Esq. International Wool Secretariat. Ladies to be invited. The Victoria Hotel, Bridge Street, Bradford. 7.30 p.m.

**Friday, 9th March 1956**

MIDLANDS SECTION. Midlands Section Dinner. Bull's Head Hotel, Loughborough.

**Tuesday, 13th March 1956**

SCOTTISH SECTION. *The Soiling of Synthetic Fibres*. G. G. Taylor, Esq., B.Sc., A.Inst.P. (Clayton Dyestuffs Co. Ltd.). St. Enoch's Hotel, Glasgow. 7 p.m.

BRADFORD JUNIOR BRANCH. *Some Aspects of Continuous Vat Dyeing*. Dr. R. J. Rallings (British Cotton Industries Research Association). Technical College, Bradford. 7.15 p.m.

**Wednesday, 14th March 1956**

NORTHERN IRELAND SECTION. *Various Methods of Stripping Vat, Azoic, Direct and Sulphur Dyes*. J. E. Riordan, Esq. (College of Technology, Belfast). *Effect of pH on the Activity of Bleaching Agents*. J. Boyd, Esq. (College of Technology, Belfast). Thompson's Restaurant, Donegall Place, Belfast. 7.30 p.m.

**Friday, 16th March 1956**

MANCHESTER SECTION. Subject to be announced later. Textile Institute, 10 Blackfriars Street, Manchester 10. 6.30 p.m.

**Tuesday, 20th March 1956**

HUDDERSFIELD SECTION. *A New Approach to High Temperature Dyeing*. S. N. Bradshaw, Esq. (Courtaulds Ltd.). Huddersfield. 7.30 p.m. (Venue later)

**Wednesday, 21st March 1956**

MIDLANDS SECTION. *Fast Dyes on Cellulose Triacetate*. J. G. Graham, Esq., B.Sc. (Joint Meeting with British Association of Chemists). Midlands Hotel, Derby. 7 p.m.

**Thursday, 22nd March 1956**

MIDLANDS SECTION. *Dyeing Faults in the Carpet and Hosiery Industries*. G. H. Lister, Esq., B.Sc., Ph.D. (Joint Meeting with the Textile Institute). Carpet Trades Canteen, Kidderminster. 7 p.m.

WEST RIDING SECTION. Annual General Meeting. The Victoria Hotel, Bridge Street, Bradford. 7.30 p.m.

continued on page xxxii





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# THE JOURNAL

OF THE

## Society of Dyers and Colourists

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Volume 72 Number 1

JANUARY 1956

Issued Monthly

### OFFICIAL NOTICES

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#### OBJECTS OF THE SOCIETY OF DYERS AND COLOURISTS

To promote the advancement of science and technology, especially in the theory and practice of the tinctorial arts.

To provide means for the wider dissemination and interchange of knowledge concerning the science and technology of colour and colouring matters, of their methods of application, and of the materials to which they may be applied.

To encourage education and research in any or all of the above subjects.

And for the furtherance of these objects—

To hold meetings for the reading of papers, for lectures, and for discussions.

To publish a *Journal*.

And to do all such other things as may be conducive to the attainment of these objects.

#### ELECTION OF OFFICERS AND MEMBERS OF COUNCIL

Under the revised Bye-laws which are now operative, Officers and Members of Council—other than the President and President-elect, who are nominated by Council and elected at the Annual General Meeting—are to be elected by a Postal Ballot of the members.

The attention of members is drawn to Bye-laws No.

12-21 inclusive and 22-26 inclusive, which relate to Officers and Members of Council respectively.

Nominations to be valid must be received by the Honorary Secretary of the Society at least six weeks prior to the date of the Annual General Meeting, which is on 27th April 1956.

#### MEMBERS AND JUNIOR MEMBERS

Persons desirous of joining the Society as Ordinary Members or Junior Members may obtain Application Forms from the Secretary or from the Honorary Secretary of any Section of the Society. Applications must be proposed and seconded by members to whom the applicants are known personally. The rates of annual subscription are as follows—

(i) During the period of "full-time national service" the annual subscription to be waived entirely. Such members will be asked whether they wish to receive the *Journal*.

(ii) Ordinary Members between the ages of 21 and 25 years who are students, i.e. who are pursuing an accepted course, full or part time, at a recognised

technical college or university and vouched for by the head of their department or other responsible person—15s. 0d.

(iii) Other Ordinary Members between the ages of 21 and 25 years—£2 2s. 0d.

(iv) Members having had forty years' continuous membership of the Society to be given the option of paying half the current annual subscription (vi) for Ordinary Members.

(v) Members having had fifty years' continuous membership of the Society—the annual subscription to be waived entirely.

(vi) All other Ordinary Members—£3 3s. 0d.

(vii) All other Junior Members—15s. 0d.

#### FELLOWS, ASSOCIATES, AND REGISTERED STUDENTS

The Society confers diplomas in tinctorial technology on suitably qualified members. These distinctions are in two grades—the Associateship and the Fellowship—and confer the right to use the title Associate of the Society of Dyers and Colourists (A.S.D.C.) or Fellow of the Society of Dyers and Colourists (F.S.D.C.). To obtain the Associateship candidates are required to pass the prescribed examinations and to furnish evidence of satisfactory general education and of training and experience in at least one branch of the manufacture or application of

colouring matters. The Fellowship is conferred on senior members who have attained high standing in the knowledge and practice of tinctorial technology. Students who intend to take the Society's examination are strongly recommended to become Registered Students, so that their studies and preparation may be effectively directed.

Copies of the regulations and syllabuses may be obtained on application to The Society of Dyers and Colourists, 19 Piccadilly, Bradford 1, Yorkshire.

#### The JOURNAL

The *Journal* is posted free to all Members. Non-members can obtain copies on application to the Offices of the Society. All orders must be accompanied by a remittance of 6s. 8d. per copy (£4 0s. 0d. per annum post free). Back numbers of most issues of the Society's *Journal* can be supplied.

Members are reminded that under Bye-law 41 the *Journal* will not be forwarded to those who have not paid their subscription by 30th June 1956.

Members residing abroad are particularly requested to inform the Secretary by separate post when sending their subscriptions by Money Order.

Communications on any subject related to the objects of the Society, especially such as are of an original character, are invited for consideration for publication in the *Journal*. Such Communications in the first instance should be addressed to the Editor, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1, Yorkshire.

**The JOURNAL—contd.**

General communications, including inquiries or orders for advertisements, should be addressed to the Offices of the Society, to which address all remittances should be sent.

**REPRINTS OF LECTURES AND COMMUNICATIONS**

Reprints of all lectures and communications are available after publication to members of the Society and non-members. The charges (postage included) are as follows—Single copies 2s. 6d. each; per dozen copies up to and including 8 pages, 12s. 6d., and for papers occupying more than 8 pages of the *Journal*, 17s. Orders should be addressed to "The Society of Dyers and Colourists, 19 Piccadilly, Bradford 1". They can be accepted only if accompanied by remittance and if received immediately after publication of the paper.

**NOTICE TO AUTHORS OF PAPERS**

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion at the beginning of the paper. Centre headings should be employed sparingly. Side headings should be indented and underlined, and run into the text to which they apply by means of a dash. References to the literature should be numbered consecutively, using superscript numbers

**ABSTRACTS SECTION**

Attention is drawn to the fact that copies of the Abstracts Section of the *Journal* printed on only one side of the paper, so that individual abstracts can be cut out and pasted on cards, are available at a charge of 30s. 0d. per annum. Orders should be sent to the Society's offices at 19 Piccadilly, Bradford 1, Yorkshire.

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without brackets immediately following the text words or author's name to which they refer.

The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the Index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Jan. 1950 issue (p. 54) should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and they should be indicated by small circles rather than by crosses in the case of a single graph, but where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

Twenty-five free copies of a reprint are supplied to the author of an original paper published in the *Journal*, or fifty free copies are supplied when there are two or more authors, and a further number may be purchased from the Society at the rates given above.

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Lecturers are required to sign an agreement regarding copyright and publication, copies of which are supplied by the Honorary Secretaries of Sections.

The Society subscribes to the Royal Society Fair Copying Declaration (J.S.D.C., 66, 54 (Jan. 1950); 67, 236 (June 1951)).

**LOAN OF BOOKS AND PERIODICALS**

Many of the books and periodicals reviewed or abstracted in the *Journal* since 1948 (and in some cases earlier) are retained by the Society, and may be borrowed by members.

Enquiries and applications should be directed to the Society of Dyers and Colourists, 19 Piccadilly, Bradford 1, Yorkshire.

**LIBRARY OF THE CHEMICAL SOCIETY—LOAN OF BOOKS**

Members of the Society may borrow books from the very extensive collection of works on pure and applied chemistry in the Library of the Chemical Society, by applying direct to *The Librarian, The Chemical Society,*

*Burlington House, Piccadilly, London W.1 (REGent 0675-6), and referring to their membership of the Society of Dyers and Colourists.* Letters on the subject should not be addressed to the Offices of the Society in Bradford.



## DEPOSIT OF SEALED COMMUNICATIONS

I—The Society is prepared to receive from members and others and to keep as deposits, Sealed Communications dealing with any subject relating to the theory or practice of the Dyeing, Printing, and kindred industries.

II—Every deposit must bear on the cover a title for classification, the author's name, the date, and must be secured by a distinctive seal.

III—The deposit should be written in English, and, if it deals with machinery, be accompanied by sketches or drawings, or, in the case of dyeing or printing processes, by patterns.

IV—Every deposit will, unopened, be signed and sealed by the Honorary Secretary of the Society, immediately after receipt, and countersigned by another member of the Council.

V—The deposits will be numbered and entered into a

special register, and an official receipt will be sent to the author.

VI—No charge will be made for registration and deposit.

VII—The deposits will be kept by the Society for a period of seven years. At the end of this period they will be opened and the contents read before the next meeting of the Council of the Society, and the contents, or an abstract thereof, may be published in the *Journal of the Society* at the discretion of the Publications Committee.

VIII—The author shall have the right to recall his deposit unopened at any time within the said seven years, or he may, at any time, order it to be opened and read before one of the Society's meetings. Such instructions must be accompanied by the official receipt.

IX—The Society will take every reasonable care of the deposits, but cannot be held responsible for their loss.

## MEDALS AND AWARDS

## HONORARY MEMBERS OF THE SOCIETY

1886-1915	*Sir H. E. Roscoe, M.P.
1902-1926	*F. H. Bowman, D.Sc., F.I.C., F.R.S.E.
1908-1916	*Prof. Dr. C. Graebe
1908-1915	*Prof. Dr. C. Liebermann
1911-1916	*Prof. Adolf von Baeyer
1914-1924	*Count Hilaire de Chardonnet
1917-1941	*Arthur G. Green, M.Sc., F.I.C., F.R.S.
1919-1938	*R. Vidal
1921-1930	*Horace A. Lowe
1923-1935	*Charles F. Cross, F.R.S.
1925-1927	*Maurice Prud'homme
1927-1930	*Ernest Hickson
1928-1939	*R. E. Schmidt
1931-1933	*Alfred Rée, Ph.D.
1932-1940	*W. M. Gardner
1934-1947	*George Douglas
1934-1946	*H. Grandage

1934-1940	*Christopher Rawson
1941-1948	*Prof. E. C. C. Baly, C.B.E., M.Sc., F.R.S.
1944-1946	*Prof. F. M. Rowe, D.Sc., F.R.I.C., F.R.S.
1946-1946	*James S. Ridsdale
1947	C. J. T. Cronshaw, D.Sc., F.R.I.C., M.I.Chem.E., F.T.I., F.R.S.E., F.S.D.C.
1948	H. Jennison, M.C., A.M.C.T., A.R.I.C., F.S.D.C.
1950-1953	*George E. Holden, C.B.E., M.Sc., F.R.I.C.
1953	John Barritt, B.Sc., A.R.C.S., A.R.I.C., F.S.D.C.
1954	Fred Scholefield, M.Sc., F.R.I.C., F.T.I., F.S.D.C.
	Croyden Meredith Whittaker, D.Sc., F.T.I., F.S.D.C.
1955	Sir Robert Robinson, O.M., M.A., D.Sc., F.R.S.E., F.R.S.

The following have been *ex officio* Honorary Members of the Society, the later dates indicating termination or change in title of the office—

1886-1920	The Worshipful Master of the Dyers' Company	1886-1900	The President, Bradford Technical College
1920-	The Prime Warden of the Worshipful Company of Dyers	1900-1905	*W. E. B. Priestley, Chairman of the Technical Instruction Committee of the Bradford City Council

\*Deceased

## THE PERKIN MEDAL

The Perkin Medal was modelled by the late F. W. Pomeroy, R.A., for the Society. It is an excellent presentation of the head of Sir William Perkin, the founder of the coal-tar colour industry, and President of the Society in 1907.

This medal is awarded for discoveries or work of outstanding importance in connection with the tinctorial arts.

## LIST OF RECIPIENTS

1908	Professors Graebe and Liebermann. "Synthesis of Alizarin."
1911	Prof. Adolf von Baeyer. "Synthesis of Indigo."
1914	Comte Hilaire de Chardonnet. "Artificial Silk."
1917	Prof. Arthur G. Green. "Primuline."
1919	R. Vidal. "Sulphur Black."
1921	Horace Lowe. "Permanent Lustre on Cotton."
1923	Chas. F. Cross. "Discovery of Viscose."
1925	M. Prud'homme. "Aniline Black and Alizarin Blue."
1928	Dr. Robert E. Schmidt. "For Epoch-making Discoveries of Anthraquinone Derivatives and Dyestuffs therefrom."
1938	Dr. H. Dreyfus. "For Discoveries and Work of Outstanding Importance in Connection with the Development of the Cellulose Acetate Rayon Industry in England."
1938	J. Baddiley. "In recognition of his National Services for the Renaissance of the British Dyestuffs Industry through Many Important Investigations in the Field of Colour Chemistry Conducted or Directed by him."
1950	Prof. J. B. Speakman. "In recognition of his Outstanding Contributions to the Science and Technology of Textiles."
1954	Dr. Arthur Zitcher. "For his Work leading to the Discovery of the New Class of Azoic Dyes, based on the Arylamides of o-Hydroxycarboxylic Acids."





### THE MEDAL OF THE SOCIETY OF DYERS AND COLOURISTS

This Medal was instituted by the Society in 1903. Of the competitive designs submitted, that of Mr. Edgar Lockwood was selected. The design indicates that the work of the dyer (centre figure) is both a science (right background) and an art (left foreground).

1903-1927 The Medal was occasionally awarded as a recognition of work of exceptional merit carried out under the Society's Research Scheme.

From 1928 The Medal was awarded as a recognition of exceptional services (a) to the Society or (b) in the interests of the Tinctorial and Allied Industries.

#### LIST OF RECIPIENTS

- 1908 J. B. Fothergill (Bronze Medal). "Treatment of Cotton to Cause it to Resist Direct Dyeing Colours."
- 1912 J. H. Garner (Silver Medal). "Treatment of Effluents from Dyehouses and Textile Factories."
- 1928 Ernest Hickson (Gold Medal). "Exceptional Services rendered to the Society as Chairman of the Publications Committee 1897-1925, and Chairman of Colour Index Committee."
- 1930 Arthur Silverwood (Gold Medal). "Exceptional Services rendered to the Society as Honorary Secretary 1913-1930."
- 1933 Prof. Walter M. Gardner (Gold Medal). "Distinguished Services as Editor of the Society's *Journal* 1900 to 1932."
- 1934 Prof. F. M. Rowe (Gold Medal). "Exceptional Services to the Society and to the Tinctorial Industries as Editor of the *Colour Index* 1924 and the 'Supplement' 1928."
- L. A. Lantz (Chairman), H. H. Bowen, P. W. Cunliffe, R. S. Horsfall, Prof. B. A. McSwiney, C. C. N. Vass, C. M. Whittaker, S. G. Barker (Silver Medals). "Exceptional Services to the Society as Members of the Standardisation of Fastness Executive Committee."
- 1936 W. A. Edwards (Silver Medal). "Valuable Services rendered to the Society as Honorary Secretary of the Midlands Section since its inception in 1919 to 1935."
- 1937 R. Ritchie (Silver Medal). "Devoted and Valuable Services as Honorary Secretary of the Scottish Section for eighteen years."
- 1940 F. L. Goodall (Gold Medal). "Valuable Services to the Tinctorial Industries by his work on the Theory and Practice of Wool Dyeing."
- 1943 C. M. Whittaker (Gold Medal). "In recognition of Exceptional Services in promoting Scientific and Technical Knowledge amongst Textile Colourists, and for Sustained and Outstanding Service to the Society."
- 1946 H. H. Bowen (Gold Medal). "For Outstanding Services to the Society and in recognition of his Chairmanship of the Publications Committee for a period of twenty years."
- R. H. Hodgson (Gold Medal). "For Outstanding Services to the Society and for his series of Sustained Experimental and Theoretical Contributions to those chapters of Organic Chemistry which are the essential scientific background to the Dyestuffs Industry."
- E. Race (Silver Medal). "For his Valued Services to the Society as Joint Author of thirteen papers published in the Society's *Journal*."
- H. Turner (Silver Medal). "In recognition of his Valuable Services to the Society and of his twenty-two years' service as Honorary Secretary of the Huddersfield Section."
- Mrs. E. Cummings (née Levin) (Silver Medal). "For her Valued Services to the Society; by her assistance rendered in the preparation of the first *Colour Index*; by her Joint Authorship of a number of Papers published in the *Journal* of the Society, and as an Abstractor for the *Journal* of the Society for twenty years."
- 1947 Fred Smith (Gold Medal). "For Exceptional Services to the Society over a period of thirty-seven years comprising Chairman, West Riding Section; Member of Council and of many important Committees."
- F. Scholefield (Gold Medal). "In recognition of Exceptional Services to the Society in the advancement of Tinctorial Technology both in theory and practice."
- C. Schardt (Silver Medal). "In recognition of his Valuable Services to the Society over a period of twenty-four years including Chairman, Vice-Chairman, and member, of the Midlands Section Committee."
- 1948 G. G. Hopkinson (Gold Medal). "For Valuable Services rendered to the Society and to the Dyeing Industry."
- D. B. F. McAndrew (Silver Medal). "For Valuable Services rendered to the Society as Honorary Secretary and Committee Member of the Scottish Section 1935-1947."
- C. O. Clark (Silver Medal). "For Valuable Services rendered to the Society from 1923 to 1948."
- 1949 S. M. Neale (Gold Medal). "For his Pioneer Work in the Application of the Methods of Physical Chemistry to the Elucidation of the Phenomena of Dyeing, more particularly of Cellulosic Materials with Substantive Dyes."
- 1950 P. W. Cunliffe (Gold Medal). "For Outstanding Services to the Society and to the Tinctorial and Allied Industries."
- H. Foster (Gold Medal). "For Outstanding Services to the Society."
- L. A. Lantz (Bar attached to Silver Medal previously awarded). "For Exceptional Services to the Society and to the Tinctorial and Allied Industries in connection with Fastness Tests."
- 1951 W. Kilby (Gold Medal). "For Work on the Development of a Molten Metal Process of Continuous Dyeing."
- 1953 H. A. Turner (Gold Medal). "For his Valuable Researches contributed to the Tinctorial Industries."
- A. W. Carpenter (Silver Medal). "For Valuable Services to the Society."
- Miss M. Forbes (Bronze Medal). "For Valuable Services to the Society."
- H. R. Hadfield (Bronze Medal). "For Valuable Services to the Society."
- 1954 George Stuart James White (Gold Medal). "For Exceptional Services to the Society and to the Tinctorial and Allied Industries."
- Clifford Collier Wilcock (Silver Medal). "For Exceptional Services to the Society and to the Tinctorial and Allied Industries."
- 1955 James Porter (Silver Medal). "For Outstanding Services to the Society, notably in the Inauguration and the Development of the Northern Ireland Section."

## THE WORSHIPFUL COMPANY OF DYERS RESEARCH MEDAL

The Medal represents the Arms of the Worshipful Company of Dyers of the City of London, which were granted in 1471. The following is a brief description—

**Arms**—Sable, a chevron engrailed argent, between three bags of madder of the last, corded or.

**Crest**—On a wreath three sprigs of the gaintree erect vert, fructed gules.

**Supporters**—Two leopards rampant gardant argent, spotted with various colours; fire issuing from their ears and mouth proper, both ducally crowned or.

**Motto**—Da Gloriam Deo.

1—The Dyers' Company offer annually a Gold Medal called "The Worshipful Company of Dyers Research Medal", the award of which is open to the Authors of papers embodying the results of scientific research or technical investigation connected with the tinctorial arts submitted to the Society of Dyers and Colourists, and published in the *Journal* of such Society during the twelve months ending on the 30th June in the year for which the Medal is granted, and, in the special circumstance provided for by Rule 6, during the twelve months ending on the 30th June in the year previous to that for which the Medal is granted. If a paper shall be published in two or more parts, then for the purpose of the award of the Medal, all the parts together shall be treated as a paper published in the year in which the final part is published.

2—The Medal will not be awarded to the same person on more than one occasion.

3—The Society of Dyers and Colourists shall consider the papers available for the Medal and advise the Company as to the merits thereof, and if, in the judgment of the Society, none of the papers is of sufficient merit, the Society may recommend that the Medal be not awarded.

4—The Dyers' Company will award the Medal either to the Author of the paper which, in all the circumstances, appears to the Company to show the greatest merit, or, in the event of such paper being the work of an Author who has already been awarded the Medal, to the Author of the paper next in order of merit who has not already been awarded the Medal, and may, if the Company so thinks fit, refrain from making any award.

5—In the event of a paper being the work of two or more persons, the Author shall be taken to be that one of them whose work in the opinion of the Society of Dyers and Colourists has most substantially contributed to the merit of the scientific research or technical investigation embodied in such paper.

6—In the event of the Author of a paper of sufficient merit published in the *Journal* of the Society of Dyers and Colourists during any twelve months for which the Medal is awarded being unsuccessful in obtaining the award of the Medal for that period, the Society of Dyers and Colourists may, in their discretion, consider such paper for adjudication with the papers available for the award of the Medal for the next succeeding twelve months.



## LIST OF RECIPIENTS

- |         |  |         |   |
|---------|--|---------|---|
| 1908    | Prof. E. Knecht. "A Means of Estimating the Degree of Mercerisation in Cotton Yarns."  | 1922-23 | Prof. Arthur G. Green (Bar attached to Medal previously awarded), and K. H. Saunders. "The Ionamines—A New Class of Dyestuffs for Cellulose Acetate Silk."  |
| 1909    | Prof. Arthur G. Green. "The Chemical Technology of Aniline Black."   |         |   |
| 1910-11 | R. L. Taylor. "The Action of Carbon Dioxide and of Air on Bleaching Powder."   | 1923-24 | S. Judd Lewis (Bar attached to Medal previously awarded). "The Quantitative Determination of the Fluorescent Power of Cellulose and its Derivatives."   |
| 1911-12 | W. Harrison. "The Electrical Theory of Dyeing."  | 1924-25 | Prof. F. M. Rowe (with Diploma to Miss E. Levin, as co-author). "The Identification of Azo Colours on the Fibre and of Azo Pigments in Substance."  |
| 1912-13 | S. H. Higgins. "Observations on the Bleaching of Cotton" and "The Action of Neutral Salts on Bleaching Solutions."   | 1925-26 | H. H. Hodgson. "Behaviour of the Sulphides of Sodium in Aqueous and Alcoholic Media", and "The Action of Sulphur on the Monochloranilines."   |
| 1913-14 | W. Johnson (in conjunction with Prof. Arthur G. Green, who had already been awarded the Medal). "The Constitution of Aged and of Bichromate Aniline Blacks." | 1926-27 | Prof. F. M. Rowe (Bar attached to Medal previously awarded) and Diplomas awarded to collaborators—Miss E. Levin, A. C. Burns, J. S. H. Davies, and W. Tepper. "A New Reaction of Certain Diazosulphonates derived from $\beta$ -Naphthol-1-sulphonic acid, leading to the preparation of Phthalazine, Phthalazone and Phthalimidine Derivatives." |
| 1914-15 | Morris Fort. "The Mechanism of the Acid Dye-bath."   | 1927-28 | No award.   |
| 1915-16 | James R. Hannay. "The Interaction between Metallic Copper and certain Dyes of the Thiazine, Oxazine and Azine Series."                                       | 1928-29 | F. Scholefield (with diplomas to Miss E. Hibbert and C. K. Patel as co-authors). "The Action of Light on Dyed Colours."   |
| 1916-17 | Prof. H. M. Dawson. "The Phenomena of Acid Catalysis and the Theory of Acids."   | 1929-30 | H. H. Hodgson (Bar attached to Medal previously awarded). "Colour and Constitution from the Standpoint of Recent Electronic Theory."  |
| 1917-18 | L. G. Radcliffe. "The Sulphonation of Fixed Oils."   | 1930-31 | Prof. F. M. Rowe (Second Bar attached to Medal previously awarded), and Diplomas awarded to S. Ueno and F. H. Jowett as collaborators. "Insoluble Azo Colours on the Fibre and Action of Boiling Caustic Soda thereon."   |
| 1918-19 | Chas. F. Cross (Diplomas presented to M. C. Lamb and C. V. Greenwood as co-authors). "Colloidal Tannin Compounds and their Applications."                    | 1931-32 | No award.   |
| 1919-20 | A. E. Everest (Diploma presented to A. J. Hall as co-author). "The Tinctorial Properties of some Anthocyanins and certain Related Compounds."                |         |   |
| 1920-21 | Prof. G. T. Morgan. "The Co-ordination Theory of Valency in Relation to Adjunctive Dyeing."  |         |   |
| 1921-22 | S. Judd Lewis. "On the Fluorescence of Cellulose and its Derivatives."   |         |   |



- 1932-33 Two awards—W. T. Astbury. "The X-ray Interpretation of Fibre Structure."  
J. B. Speakman. "The Structure of the Wool Fibre; its Relation to the Dyeing and Finishing Processes of the Wool Textile Trade."
- 1933-34 No award.
- 1934-35 H. A. Turner, and Diplomas awarded to G. M. Nabar and F. Scholefield, as co-authors. "The effect of Reduced Vat Dyes upon the Hypochlorite Oxidation of Cellulose."
- 1935-36 Prof. F. M. Rowe (Third Bar attached to Medal previously awarded), and Diplomas awarded to C. H. Giles, R. L. M. Allen, W. G. Dangerfield, and Glyn Owen, as collaborators. "Decomposition of Azo Dyes by Acids, Caustic Alkalies, and Reducing Agents."
- 1936-37 J. B. Speakman (Bar attached to Medal previously awarded), and Diplomas awarded to C. S. Whewell and J. L. Stoves, as collaborators. "The Reactivity of the Sulphur Linkage in Animal Fibres."
- 1937-38 Prof. F. M. Rowe (Fourth Bar attached to Medal previously awarded), and J. B. Speakman (Second Bar attached to Medal previously awarded), and Diplomas awarded to E. Race and T. Vickerstaff, as collaborators. "The Uneven Dyeing of Wool with Acid and Chrome Dyes. Part I—The Reasons for the Uneven Dyeing Properties of Wool Staples and of Cloth Damaged by Exposure, and Part II—A Method for Correcting the Uneven Dyeing Properties of Wool Staples and of Cloth Damaged by Exposure."
- 1938-39 No award.
- 1939-40 T. H. Morton, as senior author of the paper on "Application of Vat Dyes to Viscose Rayon", by J. Boulton and T. H. Morton.
- 1940-41 No award.
- 1941-42 T. Vickerstaff, as senior author of the paper on "The Dyeing of Cellulose Acetate Rayon with Dispersed Dyes", by T. Vickerstaff and E. Waters.
- 1942-43 No award.
- 1943-44 J. Boulton. "The Importance of Dyeing Rate—an Interpretation for the Practical Dyer of Recent Research on Direct Dyeing."
- 1944-45 No award.
- 1945-46 No award.
- 1946-47 H. Phillips, as senior author of the paper on "The Chemical Constitution and Physical Properties of Bisulphited Wool", by E. G. H. Carter, W. R. Middlebrook, and H. Phillips.
- 1947-48 J. M. Preston. "Some Factors affecting the Dyeing of Viscose" and "Some Aspects of the Drying and Heating of Textiles."
- 1948-49 H. Lindley, as major contributor to the paper "The Mechanism of Set and Supercontraction in Wool Fibres", by S. Blackburn and H. Lindley.
- 1949-50 No award.
- 1950-51 J. Crank. "The Diffusion of Direct Dyes into Cellulose. III—The Present State of the Theory and its Application."
- 1951-52 H. Hampson. "Advances in the Application of Vat Dyes to Viscose Rayon Cakes".
- 1952-53 R. H. Peters, as senior author of the paper on "The Reduction Properties of Vat Dyes", by W. J. Marshall and R. H. Peters.
- 1953-54 R. J. Hannay, as senior author of the papers "A New Method of pH Control in Dyeing and Some Observations on the Metachrome Process", by R. J. Hannay, W. H. Major, and R. Pickin, and "The Use of Hydrolysable Esters in the Control of Dyebaths", by R. J. Hannay and W. H. Major.

#### THE WORSHIPFUL COMPANY OF FELTMAKERS RESEARCH MEDAL

The Feltmakers' Company offer annually a Gold Medal for Papers embodying the results of scientific research or technical investigation connected with the art of feltmaking and published in the *Journal of the Society*. Further, in order to encourage research of a type likely to qualify for the award of the Medal, the Feltmakers' Company offer annually, for an initial period of five years, a Research Grant of £50.

1945-1955 No award.

#### KNECHT MEMORIAL FUND

A Fund of £100 was subscribed as a Memorial to the late Professor Edmund Knecht, from the interest on which two prizes, in the form of books, are awarded annually to selected students of the Manchester College of Technology and the Royal Technical College, Salford.

#### MERCER LECTURES

A sum of £20 per annum is being given to the Society for a limited period of years in commemoration of the centenary of the discovery of mercerisation. Suitable lecturers are invited to give a Mercer Lecture annually.

- 1944 N. G. McCulloch and G. S. Hibbert. "Science in an Old Industry."
- 1945 G. S. J. White, B.A., and T. Vickerstaff, Ph.D. "Colour."
- 1946 D. Entwistle, B.Sc., A.R.I.C. "Regenerated Fibres from Natural Polymers."
- 1947 E. J. Bowen, M.A., F.R.S. "Colour and Constitution—The Absorption of Light by Chemical Compounds."
- 1948 F. Farrington, B.Sc., F.R.I.C. "Textile Printing."
- 1949 E. Wilson, B.A. "Some Applications of Chemistry to Textile Finishing."
- 1950 A. B. Meggy, Ph.D., A.R.I.C. "Some Recent Developments in the Theory of Dyeing."
- 1951 D. Traill, Ph.D., F.R.I.C., F.T.I. "Some Trials by Ingenious Inquisitive Persons—Regenerated Protein Fibres."
- 1952 F. C. Wood, M.Sc., Ph.D., F.R.I.C., F.T.I. "Non-felting Wool and Wool Mixtures."
- 1953 J. R. Blockey, M.Sc., F.R.I.C., and D. H. Tuck, A.L.C. "The Coloration of Leather."
- 1954 N. W. Yelland, B.Sc., A.R.C.S., D.I.C. "Physics in the Dyeing, Printing, and Finishing Industries."
- 1955 G. Landells, Ph.D., A.R.I.C., F.S.D.C. "Modern Resin Finishing."

#### GEORGE DOUGLAS LECTURE

A sum of £2000 was given to the Society by the Bradford Dyers' Association Ltd., the income from the investment of which is employed in providing a biennial lecture on some subject connected with the colouring or finishing of textiles.

- 1949 H. Levinstein, M.Sc., Ph.D., M.I.Chem.E., F.R.I.C. "George Douglas, His Times, and Some Thoughts on the Future."
- 1952 R. Hill, Ph.D. "Synthetic Fibres in Prospect and Retrospect."
- 1953 T. Holbro, Ph.D. "The Search for New Dyes in relation to Modern Developments in the Textile Field."



## Proceedings of the Society

### Some Observations on American Bleaching and Dyeing Practice

J. K. SKELLY

*Meeting of the Northern Ireland Section held at Thompson's Restaurant, Belfast, on 10th November 1954,  
Mr. J. Montgomery in the chair*

The applications of the established American bleaching and dyeing processes for cotton piece goods are discussed. An outline is given of the Becco, du Pont, and Mathieson continuous bleaching systems. The practical uses of the Williams unit and pad-steam dyeing ranges are indicated. Particular attention is paid to the factors influencing the advantages and limitations of each of these processes.

#### Introduction

A study has been made of processes observed in American plants during 1952-1953. The continuous processing methods noted related in the main to practice in the Southern United States, where the plants had a high degree of specialisation. By comparison, production in the New England area was more diversified, and the older conventional processing methods were commoner in this region. The processes observed were restricted to cotton piece goods.

#### Preparation and Bleaching of Cotton Fabrics

##### DESIZING

The main features of interest in desizing were the methods adopted to store the cloth singed and padded with enzymatic desize liquor as a quench. Heavy-weight cloths were piled into trucks at open width, but lighter-weight cloths were either stored in bins or passed into heated J boxes in rope form. When wooden J pilers with steam-coil heaters on each side or stainless-steel Becco-type steam J boxes were employed, the process was made continuous.

##### OPEN-WIDTH SCOURING

This operation was carried out on heavy twills and satens as preparation for vat and sulphur dyeing in heavy shades. The process was made practically continuous in a progressive boil-off machine, which had ten jig-type beams each capable of holding 2000-yd. batches, the beams all being placed above one open bath, in which the scouring took place. The bath contained 5% caustic soda, obtained from recuperators on mercerising ranges, and the liquor was maintained at 200°F. The 2000-yd. batches were passed from beam to beam down the machine, each time being given a passage through the hot caustic solution. After the scour the fabrics were washed at width in boiling water and batched for drying.

##### KIER BOILING AND CHEMICKING

Alkali boiling in stainless-steel kiers or cast-iron kiers lined with stainless steel was still widely practised, especially where cloths of varied weights were processed. Automatic temperature and pressure controllers and recorders were seen in operation on kiers, and were claimed to save steam and give more regular results. With respect to chemicking, pit-type saturators were in general

use for application of chemic, but methods of storing the saturated cloth varied. Wooden or concrete bins provided storage in discontinuous working, but many works used wooden Gantt pilers or modified J boxes to make the bleaching process continuous after kier boiling. The J boxes were constructed with a slotted wooden vertical section to allow air circulation and were of greater capacity than the older Gantt pilers. Tight-strand rope washers were often seen in use for washing off, although in some plants they had been replaced by the efficient tensionless Tensitrol washers of the Rodney Hunt Machine Co. Completely continuous hypochlorite bleaching processes were not employed as common practice, although patents have been taken out to protect such processes<sup>1</sup>. It was interesting to note that all the bleacheries visited which had installed continuous peroxide bleaching ranges always retained at least some kier boiling and chemicking equipment, as the continuous ranges handled in general only limited ranges of weights of goods.

##### CONTINUOUS BLEACHING

A large volume of cotton bleached in the U.S.A. was continuously processed by the sequence—

Pad with 4% caustic soda at 160°F.

Steam for at least 60 min. at 200-210°F.

Hot wash and cool

Pad with hydrogen peroxide (0.8-1.2 vol.) at 100°F.

Steam for not longer than 60 min. at 200-210°F.

Wash-off hot and store in bins.

The methods of continuous bleaching differed mainly in the equipment utilised for the steaming stages.

##### STEAMING EQUIPMENT

Stainless-steel J boxes were widely adopted for both rope and open-width processing<sup>2</sup>.

##### (i) Becco-type J Box<sup>2</sup>

The Becco (Buffalo Electro-chemical Corp'n.) or steam J box appeared to be the simplest type in operation. The steam was injected directly into the J just below the entry level of the cloth, and was then carried forward by the slowly moving cloth. The J box was well insulated, and a drain pipe in the heel of the J was kept open to allow condensate to run off during a run. The Becco J

boxes varied from 2 to 8 ft. in width but were always 18 in. deep; i.e. the distance between opposite steam inlets was constant irrespective of the width of the box. The steam supply to the inlets of the J was normally controlled by a single thermocouple placed 18 in. above the steam inlets on the entry side of the box<sup>4</sup>. The entrance to the Becco J box was quite open to the air; when it was full of cloth, steam issued slowly from the top of the box. The entrance being open meant that the

yardage of one width of fabric was required to be treated. By comparison, rope ranges were used for bleaching lighter weights of fabrics of rather varying widths.

### (iii) Mathieson Steamer<sup>8</sup>

Interest in the use of Mathieson steamers (Fig. 1) for open-width bleaching appeared to be increasing, especially in plants specialising in the heavier type of cotton goods. The number of installations of this

type was much less than with types (i) and (ii). Mechanically, the Mathieson steamer was basically three superimposed stainless-steel conveyors enclosed in an atmosphere of steam at 200–210°F. The cloth was plaited at width on to the uppermost conveyor, travelled slowly along the length of the steamer, then slid on to the conveyor underneath, and similarly moved to the third conveyor. Each conveyor was made up from stainless-steel sections ca. 8 in. wide having perforations of diameter ca.  $\frac{1}{4}$  in. across each section. This costly

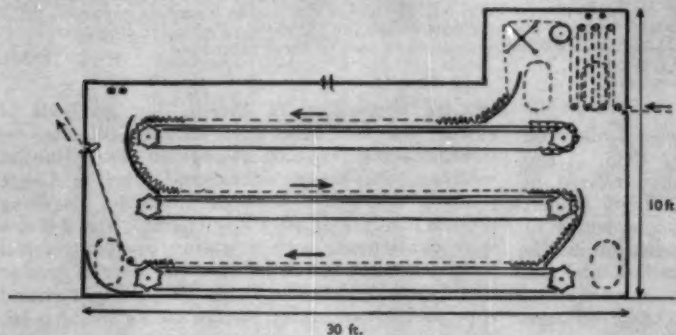


FIG. 1—Mathieson Open-width Steamer

plaiting equipment could be placed well above the box, and was then readily available for maintenance. The relatively simple steam J box appeared to be used almost exclusively for rope bleaching, although a modified steam J box was available for bleaching at open width<sup>3,5</sup>.

### (ii) du Pont-type J Box<sup>6</sup>

The du Pont J box differed from the Becco type in the mode of steam injection. In the du Pont box the steam was not fed directly into the J; instead, the cloth passed through a steam preheater tube before entering the J proper for storage. In the preheater tube the steam ran counter to the cloth, and the temperature was controlled by a thermocouple placed near the entrance to the preheater tube<sup>4</sup>. The preheater tube placed before the J box necessitated enclosing the plaiter inside the box. This was a disadvantage for maintenance purposes, especially for minor repairs during a run. The rollers and bearings in the preheater tube also required maintenance periodically. However, the du Pont J box had not a critical depth like type (i), and when such J boxes were used in the bleaching of bulky light-weight goods, the capacity was very large indeed.

The du Pont J box also found considerable use for open-width bleaching<sup>7</sup>. In this instance the cloth was evenly heated in the preheater tube at width before entering the J. However, the versatility of open-width equipment of this type was limited. It was found that an open-width J box designed for a certain width of cloth would not satisfactorily process much narrower cloths, as steam losses in the J were then too large and the temperature could not be maintained above 200°F. Thus open-width equipment was installed for bleaching heavier weights of goods only where sufficient

equipment was employed to prepare heavy-weight fabrics for vat dyeing; when goods of the same type were to be finished white a further hypochlorite treatment was normally required after the continuous bleach. The set-up of the plaiters inside the steamer, the time given in the steamer, and the expression of the mangle placed before the steamer had to be arranged to avoid formation of "lay marks" on the cloth against the hot metal conveyors. This reduced the versatility of the equipment. Control of the steamer was relatively simple<sup>4</sup>, as the whole steamer was filled with steam and three thermocouples were installed to maintain the temperature in the region 200–210°F.

The Mathieson steamer continuous bleaching range operated at approx. 60 yd./min. for heavy fabrics; while rope bleaching ranges using J boxes of type (i) or (ii) ran at 150–280 yd./min. for lighter-weight fabrics. The fabrics bleached at the very high operating speeds were open light-weight cloths readily bleached by any conventional process.

### EXAMPLES

#### (i) Becco-type Range

The range shown in Fig. 2 was employed to bleach cloths of 3.85–6.0 yd./lb. and 30–41 in. wide. The washing and saturating stages were carried out at width. Williams units were used as washers, with a heat exchanger partly heating the incoming wash water for the units by the hot waste washings. The cloth was treated in twistless rope form in the J boxes, and readily opened to width again by pairs of spring-mounted expander rollers. In this range no caustic soda was added to the hydrogen peroxide impregnating liquor, as sufficient residual caustic remained in the cloth after hot washing. The ratio of caustic soda to sodium

- A Caustic soda saturator
- B Caustic soda J box
- C Expander rollers
- D Open-width washers (Williams units)
- E Cold water spray
- F Hydrogen peroxide saturator
- G Hydrogen peroxide J box

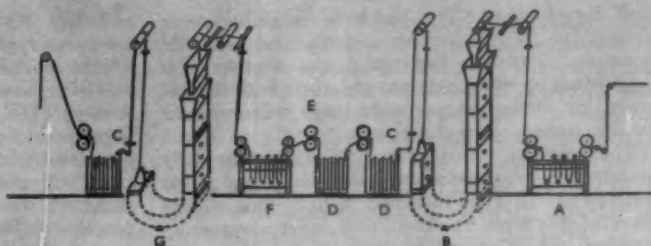


FIG. 2—Continuous Bleaching Range with Beco-type J Boxes

silicate was shown to be important<sup>9</sup> to avoid deposition of silica or silicates in the J box, which would prevent smooth movement of cloth in the heel of the J. This deposit was readily removed in practice by boiling strong hydrogen peroxide solution in the heel of the box.

The range had D.C. drive and could operate in three distinct sections. The two J boxes held 10,000–20,000 yd. of cloth, and considerable variation in the amount of cloth in each J box was possible providing that the correct steam inlet was open. Thus the range was very rarely completely stopped: minor repairs could be effected in one section while the other two operated normally. Open-width washing limited the speed of the range to 150–175 yd./min. The efficiency

a 2-hr. period was given in the caustic J box. The time given in the peroxide J was never greater than 60 min., as otherwise yellowing of the white occurred. The rope-bleached cloths could not be satisfactorily dyed to other than pastel colours. All heavier-weight cloths and lighter cloths for heavy shades were bleached by kier boiling and chemicking.

#### (ii) du Pont-type Range

The range shown in Fig. 3 processed cotton lawns and voiles of 9–11 yd./lb. at 250–285 yd./min. The complete range treated the fabric in rope form, but warp tension was reduced to a minimum with the light-weight fabric by using the Tensitrol-type rope washers. Pull marks in the fabric, produced on passing the cloths over reels at the high process-

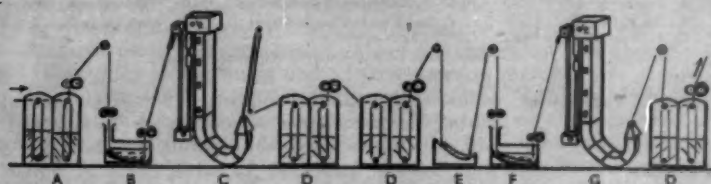


FIG. 3—Continuous Bleaching Range with du Pont-type J Boxes

- A Tensitrol rope washer (desize wash-off)
- B Caustic soda saturator
- C Caustic soda J box
- D Tensitrol washer
- E Slack box
- F Hydrogen peroxide saturator
- G Hydrogen peroxide J box

of the range was such that often at least one million yards of cloth was bleached in a working week of five days with three 8-hr. shifts per day. The white produced was good for print goods and sufficient for light-weight broadcloths and sheetings without further chemicking being necessary. The normal times of steaming in J boxes were 60 min. for both the caustic and peroxide boxes. However, in one instance where great absorbency was required

ing speeds employed, occasionally caused trouble on this range. By comparison, a small-scale range of the Butterworth Junior type was observed running at 40 yd./min. in bleaching light-weight piqué cloth. This range employed U-sectioned washers and saturators with small du Pont-type J boxes.

#### (iii) Mathieson Steamer Range

The range shown in Fig. 4 employed Mathieson steamers for preparation of 1.35–4.0 yd./lb. cotton

- A Desize saturator
- B Trucks holding desized cloth
- C Wash boxes
- D Slack box
- E Caustic soda saturator
- F Caustic soda steamer
- G Cold wash (Williams unit)
- H Hydrogen peroxide saturator
- I Hydrogen peroxide steamer

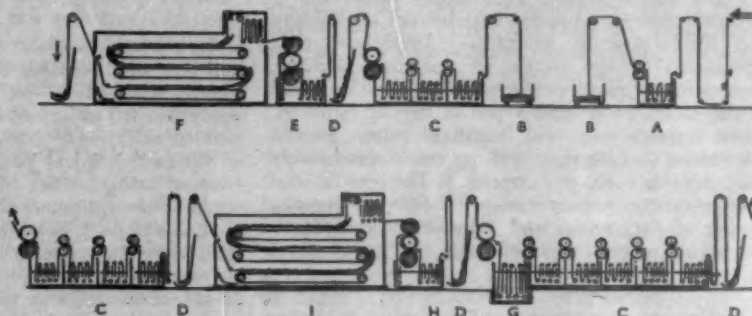


FIG. 4—Continuous Bleaching Range with Mathieson-type Open-width Steamers



twill for dyeing. The times of steaming were reduced to 30 min. for the caustic and peroxide steamers, as only a low white was required. A continuous scouring process was also given on this range, in which the peroxide stage was replaced by application of a detergent.

The quality of cotton goods continuously bleached was very satisfactory for the type of goods processed. In rope-bleached light-weight cloths good whites were obtained with good absorbency required for print goods or sheetings, etc. The standard fluidity test for chemical degradation was rarely carried out in works laboratories as a routine test. Nevertheless, random samples from different plants gave quite satisfactory fluidity figures, as has also been reported elsewhere<sup>10</sup>.

The continuous bleaching ranges developed in the U.S.A. have clearly satisfied the demand for continuous processing of large yardages in restricted weight ranges of fabrics with minimum labour supervision. Two or three operatives were all that were required to run any of the continuous ranges observed in operation. Furthermore, no matter whether the specialisation was for heavier- or lighter-weight cotton goods, continuous processing equipment had been evolved to bleach such fabrics, but each particular range was restricted in its versatility.

### Dyeing of Cotton Fabrics

#### JIG DYEING

Extensive use was made of automatic temperature controllers on individual jigs. Rolls of cloth were easily lifted on to the jig, and the batches removed again readily by means of an overhead hoist running on a monorail placed above a line of jigs. With these aids to production, it was normal practice to have one dyer in charge of three jigs.

#### CONTINUOUS DYEING

Both of the well established American continuous vat-dyeing processes, viz. the Williams unit and the pad-steam process, were widely used. It was apparent that each process had distinct advantages and limitations in practice. Important considerations in the choice of the most suitable process in any plant were type of preparation given to the cloth, range and depth of dyeing required, fabric construction, and length of runs. It was interesting to note that both processes were rarely used together in one works. The continuous dyeing ranges were versatile in that continuous dyeing of vat, azoic, and sulphur dyes could be carried out on both types of range.

##### 1. WILLIAMS DYEING RANGE

Equipment in a general-purpose range is shown in Fig. 5. The lever-set pigment-padding mangle

had two 20-in. diameter 60-in. wide medium-hardness rubber bowls. For light- and medium-weight cloths a flat upper bowl was fitted, but a 0-011-in. crown bowl was used with heavy fabrics. A 15-gal.(U.S.A.)\* jacketed pad box with automatic temperature control was fitted. As was common practice, the roller flue drier was built up on staging some 7 ft. above the range. The individual drives fitted to the rolls in the flue were not used in practice. Flue drying of pigmented cloth was carried out at 250–260° F. with automatic temperature control. A heavy three-bowl lever-set mangle was placed before the Williams units specifically for use in azoic dyeing for application of diazo components to the cloth impregnated with coupling component. Two Williams units

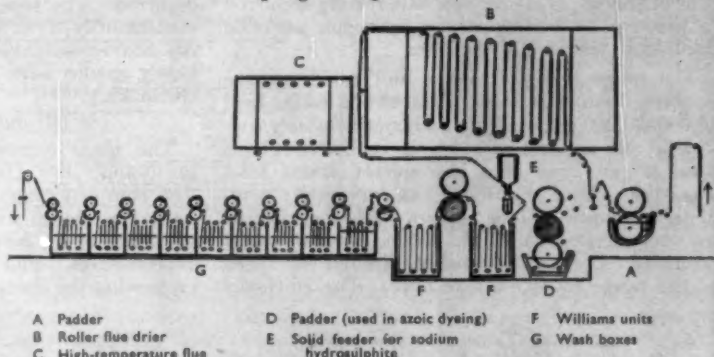


FIG. 5—Continuous Dyeing Range—Williams Process

connected in tandem followed. The first unit had 20-in. diameter squeeze bowls with rubber-steel nip, which also acted as draw rolls for cloth in the flue. Each unit held 72 gal.(U.S.A.) of liquor, and automatic temperature control was installed. The range was completed by nine wash boxes with supply tanks placed on staging beside the range. It was quite common to use slightly elliptical rollers in the bottom of wash boxes to increase the effectiveness of washing or soaping. Two out of three rollers would be elliptical, but they occasionally gave trouble owing to break-outs caused by uneven wear on bearings. Cleaning of this range took from 30–60 min. between dyeing similar colours to 4–6 hr. necessary after a long run in a deep colour.

#### Applications

##### (a) Vat Dyeing<sup>11</sup>

This process was the development of the earlier and now obsolete Dan River booster box process, which was based on rapid high-temperature reduction in an aqueous phase of vat-pigment-padded cloth. The booster box process employed a 350-gal. chemical pad and two 1300–1400 gal. booster baths for the high-temperature reduction stage. This equipment was largely replaced by the Williams units<sup>11</sup>, in which the cloth was in contact with the hot reducing liquor for approximately the same time, but the volume was reduced to 72 gal. in each unit by insertion of baffles.

\* Throughout this paper "gal." refers to United States gallons—  
1 gal.(Imperial) = 1.2 gal.(U.S.A.)



The basic procedure in the observed Williams processes was to vat-pigment-pad, flue-dry, reduce at 200°F. in caustic soda and sodium hydrosulphite in two Williams units, then wash, oxidise, wash, soap, and wash in the wash boxes. It was clear that this method had both practical advantages and difficulties. The vat-pigmented cloth was given 17–20 sec. for reduction at 180–200°F. in two units with cloth speeds of 60–70 yd./min. The fact that the reduction occurred in the aqueous phase caused a certain amount of migration and levelling of the leuco vat dye. This meant that rope-prepared cloth could be levelly dyed and open-width preparation was not a prerequisite. Also, slight unlevelness in pigment-padding could be covered in the units, and thus the pigment-padding stage was not so critical in this process as in the pad-steam method. However, while pale and medium depths were readily obtained, really heavy dyeings could not be satisfactorily dyed, as considerable stripping occurred in the units.

In practice there were certain features associated with the process which required very careful supervision to maintain an even shade during a long run<sup>12</sup>. It was necessary slowly to overflow the reducing liquor in the units during a dyeing to prevent build-up of decomposed leuco vat dye at the high temperatures employed<sup>12–15</sup>. This also lessened any possible shade change due to uneven rates of migration of different leuco vat dyes present in a mixture. White corn dextrin was the common protective agent in use. About 4 oz. per gal. was added to the units, and the temperature of the reducing liquor in the units dropped to 180°F. when the indanthrone vat blues were present; otherwise, no extra additions were made.

A major factor in this process is the equilibrium between dye on the cloth and dye in the hot reducing solution in the units. To minimise stripping action in the units certain quantities of dyes had to be added. Because of differing leuco stability and rates of exhaustion the proportions of dyes in the units were usually different from the ratios used in the pigment pad. In some shades it was necessary to add an extra dye to the units to counteract a shade change resulting from the high-temperature reduction of a dye present in the pigment-pad liquor. Considerable experience was clearly required before this equilibrium could be rapidly obtained and a level dyeing produced. At the commencement of a run with an established shade some 200–500 yd. of cloth had to be processed before a constant shade was produced. Trial patches gave only an approximation to the final shade obtained during a run, as the dyed leaders used with the patch did not set up exactly the necessary state of equilibrium<sup>12</sup>. Each trial patch required two leaders 150–200 yd. in length, and a stock of leaders in each main shade was required. About 30 min. was required to run each patch, and the liquor in the units had to be discarded after each patch because of limited stability of the leuco vat dye at 180–200°F. This entailed considerable loss of dye and chemicals. At least one trial patch was run with established shades as a check, and a

new shade required up to 8 hr. to establish. The Marhen process<sup>16</sup> was observed in use when a new shade was being worked out. The reduction potential of the reducing liquor in the units was maintained at the optimum potential for the dyes in the mix to give maximum colour value and quality of dyeing.

**EXAMPLES**—The following conditions were used to dye a medium depth on 3.85 yd./lb. sheeting at 60–70 yd./min. Vat-pigment-pad at 160°F. with 0.3% tetrasodium pyrophosphate and a small amount of wetting agent in the padding liquor. Flue-dry at 250–260°F. and run into units freshly made up containing 1.6–1.8% sodium hydroxide and 1.3–1.6% sodium dithionite (hydrosulphite) and dye maintained at 200°F. The chemical feed to the first unit only consisted of 3% sodium hydroxide and 1 lb. sodium dithionite per minute from a solid feeder. Titrations were carried out every 30 min. during a run to check the sodium hydroxide and dithionite concentrations. Clark<sup>12</sup> has noted that the caustic soda and sodium hydrosulphite concentrations in the units vary widely in different plants even for a similar shade. The reduction was followed by a cold wash and oxidation and soaping in the wash boxes. Minimum yardage in practice for this type of dyeing was 5000 yd. for an established shade, but 10,000 yd. was stated to be the minimum economic run.

This process was modified slightly with pale colours, which could be run in some cases omitting the flue drying after pigment padding. In practice it was observed that there was some difficulty with the shade running light when the drying was omitted. Other pale vat dyeings on light-weight absorbent sheeting were obtained on the same range by padding a solution of leuco vat dye. The reduced vat was padded at 120°F. by passing the fabric under a rounded steel bar placed close into the nip. The pad box was overflowed and diluted relative to the dye feed. There was only ca.  $\frac{1}{2}$  in. difference in height between the dye liquor level and the line of the nip. When running, sufficient dye liquor was picked up by the cloth from the bottom bowl, after it had passed under the steel bar, to dye the cloth before the nip was reached. Such a small volume of dye liquor was in contact with the cloth that the great substantivity of the leuco vat dye did not affect the dye concentration in the pad box. With a very pale dyeing on light-weight cloth, operating speeds of 120 yd./min. were obtained. After padding, the units were omitted, and the cold wash, oxidation and following wash were given in the wash boxes.

#### (b) Azoic Dyeing<sup>17</sup>

Level well penetrated red azoic dyeings were continuously dyed on Williams ranges, providing that a three-bowl coupling pad was installed between the roller flue and the units. Coupling components of very low substantivity, e.g. Naphtols AS and AS-D in alcoholic caustic soda solution, were padded at 180–200°F. and flue-dried at 250°F. The cloth was cooled before coupling by skying, and coupling with the diazo component, e.g. Fast Red Salt 3GC or 3GWS, was carried out

on the three-bowl pad. The coupling solution contained acetic acid to maintain a pH of 4-5, large quantities of brine, a wetting agent, and an ethylenediaminetetra-acetic acid type of sequestering agent. The coupling bath was maintained at 60-70°F. to prevent decomposition of the stabilised diazo salt. After padding with the salt, the cloth was skyed by passing above the range for 30-35 sec., the time varying for different azoic combinations. The dyed fabric was then cold-washed in the units and hot-washed, soaped, and washed in the wash boxes. The dyeing was carried out at 60-70 yd. per minute on 2-4 yd./lb. sheetings and twills with minimum runs of 5000 yd. The dyeings were not satisfactory with heavy twills woven from tightly twisted yarns, and these fabrics were jig-dyed.

#### (c) Sulphur Dyeing

It has been stated that sulphur dyes may be dyed continuously on the Williams range in a similar manner to vat dyes<sup>18</sup>. The most common method was given as follows—pad with reduced sulphur dye, complete the dyeing by passing the wet cloth directly to the units containing soda ash, sodium sulphide, and additional dye to prevent bleeding, and aftertreat in the wash boxes. This process was not seen in practice, and the extent of its use was not determined.

#### (d) Hot-oil Process<sup>19</sup>

This modification of the Williams method was not observed in operation and did not appear to have been extensively adopted. The process could be used for continuous vat and sulphur dyeing. For the former the usual process was pigment-pad, dry, chemical-pad with caustic soda and sodium hydro-sulphite at 100-120°F., and reduce and dye by passing through oil heated at 220-235°F. The oil was contained in two high-pressure (50 lb./sq.in.) steam-heated Williams units. On exit from the hot oil the fabric was passed through a hot solution of an emulsifying agent before oxidation and soaping. While the hot-oil process may be modified to dye by the reduced-pad or pigment-pad wet methods, the above process offered most advantages. The hot-oil process enabled heavy vat dyeings to be produced on Williams ranges which previously could not be readily obtained by the aqueous method. Heavy sulphur dyeings were also obtained by padding with reduced dye at 180-200°F. and passing the wet cloth into the hot oil directly<sup>20</sup>.

A range of dark vat and sulphur dyeings obtained by the hot-oil process were seen, and the dyer after a year's experience of the method stated that it worked well. However, the process has significant disadvantages<sup>18</sup>. The cost of the oil lost in processing and its removal from the cloth added to the

expense of the method compared with similar deep dyeings obtained by the pad-steam process. Further, the process was restricted to fabrics which do not retain excessive amounts of oil.

#### 2. PAD-STEAM CONTINUOUS DYEING RANGE

Equipment in a pad-steam dyeing range is shown in Fig. 6. The weight and the construction of cloth to be processed were found largely to influence the choice of equipment in the ranges observed. The type of mangle employed for pigment-padding was critical in this process<sup>12</sup>. Where a range of cloth weights were dyed, e.g. from 1.35 to 4.0 yd./lb., a two-bowl mangle was installed with either two rubber or one rubber and one steel bowls. For different weights of fabrics a set of rubber bowls with different degrees of crown or belly were available, so that the correct bowl could be selected to avoid shading across the piece. A three-bowl mangle was used in ranges specialising in dyeing heavy fabrics (ca. 1.35 yd./lb.). One range of this type used steel-rubber-steel nips with 12 tons/sq.in. pressure to give maximum penetration. The bowls were universally 20 in. in diameter, and mangles of the spring- or lever-loaded type were most common. The heavy large-diameter bowls were preferred for long runs in continuous working, rather than the lighter

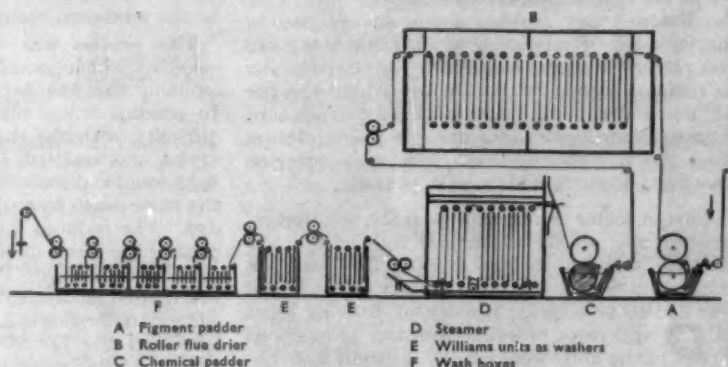


FIG. 6—Continuous Dyeing Range—Pad-Steam Process

9-11 in. bowls common in Europe. Greater pressures, better penetration, and more level dyeing were claimed from their use, apart from the fact of longer wear of the coverings when in constant use. Although padder troughs of very small volume have theoretical advantages, the capacity of the troughs seen was mostly 15 gal. for two-bowl mangles with the bottom bowl running in the liquor, and up to 30 gal. with three-bowl mangles with a partly immersed lower bowl. The larger-volume troughs had the advantage that small changes in dye concentration in the liquor did not significantly affect the shade, and a slight alteration could be detected and corrected while the dyeing continued without the shade going off completely. Further, with the 15-30 gal. trough the liquor level was more easily maintained. In some cases the level in the box was automatically controlled, while in others manual adjustment was used satisfactorily. Foam guards were universally

employed on all forms of padders. Automatic temperature controllers were also common practice.

Drying of the pigment-padded cloth was normally carried out in a roller hot flue, and the drying capacity of the flue controlled the operating speed of the range. The importance of correct construction of the flue was often emphasised to ensure even drying of the pigmented cloth. Several U.S. manufacturers have specialised in the design and construction of flue driers. Cleaning of these flues was a problem. The common method was to run a leader, padded with caustic and hydrosulphite, through the flue several times. After a long run the flue would first be blown out with compressed air and then cleaned by hand. Dye specks in the flue gave trouble with light shades even after such precautions. The chemical pad used to apply caustic soda and hydrosulphite was placed very close to the steamer—3 ft. was normal, and 6 ft. the maximum distance. This prevented decomposition of the hydrosulphite on the surface of the cloth prior to entering the steamer. The mangle was of the two- or three-bowl type, depending largely on the types of cloth processed. With heavy cloths maximum uptake of liquor was obtained by using an upper rubber nip and a bottom steel bowl in a three-bowl mangle. For lighter cloths a rubber-steel nip was used.

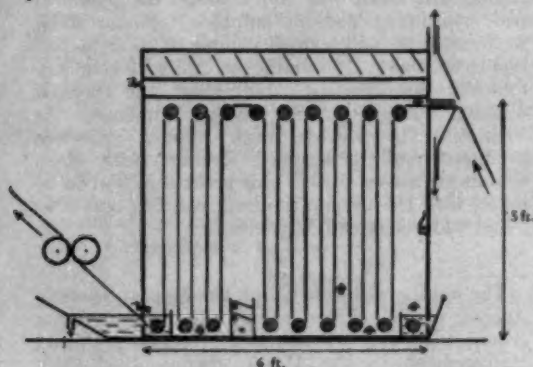


FIG. 7.—Steamer used in Pad-Steam Process

A typical steamer is shown in Fig. 7. The cloth entered the steamer through a narrow slit protected by a low-pressure steam-heated jacket placed above the slit to prevent condensation. Steam emerging from the slit was drawn away in suction ducts. Condensation drips from the roof inside the steamer were a major difficulty, and a high-pressure steam jacket with 12–20 in. insulation was built into the roof to prevent condensation. The bottom stainless-steel rollers in the steamer were all driven. General-purpose steamers had nine upper rollers, but in a larger steamer used with heavy-weight cloths twelve upper rollers were installed. The cloth passed out at the base of the steamer through a cold-water seal in which the water was constantly being changed, and then the cloth was drawn through horizontally placed draw rolls. A normal range of wash boxes or series of Williams units followed. Some plants had

installed Williams units as washers, for which purpose they were very efficient. Opinion varied on their usefulness for such a purpose, as downtime due to break-outs was high.

Pad-steam ranges could operate in two stages, viz. (a) vat-pigment-pad, dry, and plait into trucks; and (b) chemical-pad, steam, wash off, etc. Two-stage operation was used mostly with short runs of cloth. When long runs were being dyed the range was run as one unit.

#### Applications

##### (a) Vat Dyeing<sup>10, 21, 22</sup>

The pad-steam process for vat dyeing was developed by du Pont from the earlier German continuous dyeing processes<sup>23</sup>. The process could be used for dyeing all depths of colour, but in practice it appeared to be mostly used for long runs of deep vat dyeings on medium- to heavy-weight cloths (compare the Williams process, which was most economical with light to medium depths, and the hot-oil process, which was used for heavy dyeings).

The normal pad-steam sequence was pigment-pad, flue-dry, cool, chemical-pad, steam, wash, oxidise, and soap. Other variants in the process have been given<sup>23, 24</sup>, but this sequence was in most common use.

Two critical factors in this process, if satisfactory dyeings were to be obtained, were the preparation of the cloth prior to dyeing and the level application of vat dye in pigment padding. Firstly, absolutely level preparation of the cloth prior to dyeing was vital. In practice, open-width scouring and bleaching, either on a continuous range of the Mathieson or du Pont type or on a progressive boil-off machine, was given to heavy-weight goods. Only open light-weight goods could be continuously rope-prepared, and in this case it was best to desize at width to soften the cloth before processing in rope. The second factor concerned level pigment-padding and drying. This first step in the pad-steam process was much more important than with the Williams method. In the latter case some levelling occurred in the hot aqueous reducing liquor in the units, but no such degree of levelling occurred in the steamer. Great importance was attached to choice of rubber bowl with correct degree of crown for use in the pigment-padding mangle. During a run the set of the mangle could be adjusted very slightly at one side to eliminate any shading across the piece which had become noticeable.

**EXAMPLE**—A run of 200,000 yd. on 1-32 yd./lb. sateen was dyed a deep khaki after desizing and scouring at width. The cloth was pigment-padded at 160°F. and flue-dried at 250–260°F. with cloth speeds of 60 yd./min. The cloth was cooled by skyng, and then run through the chemical pad at 120°F. containing 5% caustic soda, 4% sodium hydrosulphite, 0.4% tetrasodium pyrophosphate, and wetting agent. Before the run commenced 1½ gal. of pigment pad liquor was added to the chemical pad liquor to prevent excess dye being stripped from the cloth before equilibrium in the chemical pad was established.



The straight addition of a small volume of pigment pad liquor to the relatively stable chemical pad solution at 120°F. compares with the complex state of equilibrium in the units when dyeing by the Williams process at 180–200°F. The equilibrium in the chemical pad was set up relatively quickly; nevertheless, it was usual for ca. 200 yd. to be slightly off shade before the shade had been established on the run. The caustic and hydro-sulphite concentrations in the chemical pad were high for deep colours on heavy goods compared with the concentrations used with paler colours on lighter-weight fabrics, to promote adequate reduction in the steamer. The cloth passed immediately from the chemical pad into the steamer. The steamer was brought up to 220°F., and all the air driven out before the run commenced. The temperature of the steamer during the run was 220–225°F. as measured by a thermocouple placed in the centre of one of the sides of the steamer. The actual temperature of the cloth inside the steamer was not measured in practice<sup>22</sup>. The steam inlets in the steamer had automatic temperature control, and a very even temperature was maintained. With the cloth running at 60 yd. per min. the steaming time was 27 sec. at 220–225°F. The time given in the steam atmosphere at 220°F. was sufficient to cause reduction and dyeing of the vat pigment *in situ* without giving rise to over-reduction effects, as could occur in the aqueous phase at 200°F. in Williams units. Because of the small degree of superheat in the steam inside the steamer, the wet cloth would be expected to lose weight very slightly on passing through the steamer. However, it was impossible to judge accurately whether there was a gain or a loss in weight of the cloth, because of the water seal at the exit. After steaming, the fabric was cold-washed, oxidised, and soaped in the wash boxes. Operating speeds of 60–70 yd./min. were fairly common for heavy goods, although lighter-weight goods were processed more rapidly.

#### (b) Azotic Dyeing<sup>17</sup>

This method of dyeing on the pad-steam range was almost identical to that described for the Williams range (see p. 11). One difference was that, after coupling with the diazo component in the chemical pad, the cloth was passed through the cold steamer with the doors open to give adequate time for coupling, instead of simply skying, as was done on the Williams range. It was noted that in azotic dyeing the setting of the pigment-pad mangle for application of the coupling component was not nearly so critical as with vat dyes. This type of dyeing gave excellent results, the only trouble in long runs being slight build-up of decomposed diazo component in the chemical pad box even with circulation of refrigerated water in the jacketed box.

#### (c) Sulphur Dyeing<sup>18</sup>

Two methods of continuously dyeing sulphur dyes on pad-steam ranges were observed. The first was the most common method and was based on the use of stabilised reduced sulphur dyes.

These were supplied in liquid form and did not require addition of sodium sulphide before use. Typical examples were the So-dye-sul dyes of the Southern Dyestuff Corporation. The reduced dye solution was padded at 140–160°F. on the chemical pad, and the cloth passed immediately to the steamer at 225°F. for 26 sec. steaming at 64 yd./min. The dye feed to the reduced pad was made slightly stronger than the pad liquor to counteract the substantivity of the reduced dye. On exit from the steamer the cloth was treated in two wash boxes containing sodium sulphite and sodium chloride (each 2 oz./gal.) at 140–150°F. to give a bright and clean shade in absence of prolonged washing treatment on the range. These boxes contained a small amount of reduced pad liquor to prevent excess of reduced dye from being stripped from the cloth. The cloth was washed and aftertreated normally. It was noted that the adjustment of the bowls on the reduced pad was important with these dyes to obtain a level dyeing, as there was little, if any, levelling action in the steamer. Also, preparation at width was essential on the heavier type of fabrics normally dyed with sulphur dyes.

The alternative process observed for dyeing sulphur dyes corresponded to the normal pad-steam sequence for vat dyes. After pigment-padding and drying, the cloth was run through the chemical pad containing sodium sulphide, caustic soda, wetting agent, and a small volume of pigment-pad liquor at 180°F. Steaming at 225°F. for 25 sec. followed immediately, and then the normal washing, chroming, and washing sequence. As with the vat process, both sulphur processes produced well penetrated dyeings with deep colours on heavy twills. But great care had to be taken with the preparation and padding stages to avoid unlevel streaky dyeings.

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## The Dyeing and Finishing of Nylon Ribbons

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*Meeting of the London Section held at the George Hotel, Luton, on 11th March 1955,  
Dr. H. W. Ellis in the chair*

The process of setting nylon fabrics is explained and discussed, with particular reference to plant and methods necessary for nylon ribbons. The best sequence of operations for dyeing and finishing is suggested with emphasis on the precautions necessary to achieve good results.

Alternative methods for future development are referred to, with suggestions for quicker or more direct finishing processes. Selection of dyes and bleaching agents, and methods of producing permanent effects in finishing are discussed.

### 1. INTRODUCTION

The introduction and growing popularity in recent years of nylon for ribbons of all kinds calls for a review of the most suitable methods of dyeing and finishing such fabrics. Well established processes for silk and rayon ribbons form the basis of the methods now in use, but certain modifications are called for, in the same way that knitted and broad-woven nylon fabrics necessitate extra plant and somewhat different handling of the goods. This paper will discuss the methods at present in use, and make further suggestions which may be of assistance to finishers.

### 2. SETTING

The principal revision of standard textile practice which has resulted from the introduction of nylon is the process known as *setting*, and whilst this is generally understood, it may not be out of place to define the process and outline the reasons for its application. Setting is not entirely new, though hitherto it has been introduced as a finishing process under various other names, and with the fibres concerned the effect has been transitory. Wool fabrics have for a long time been crabbed, blown, or decatized, and these processes consist in a hot moist treatment, with either boiling water or steam, of the fabric in a perfectly flat condition. Such treatment lays the surface of the fabric, removes cockle, imparts a slight lustre, and in general improves the visual appeal of the goods. The damp ironing of cotton and rayon fabrics to remove creases and give a flat finish may be loosely described as "setting", but as with wool, the effect is not permanent and is removed by washing or steaming. Incidentally, this lack of permanence is in one way an advantage, since any fabric or garment which has been mishandled or creased, or has lost definition in the shape, e.g. of pleats, can be restored by steaming and ironing or calendering.

To the finisher, this is a distinct advantage, since it can make his task less exacting.

Completely different considerations apply to nylon. A nylon fabric straight from the loom is in an unstable and receptive condition—unstable because any wet treatment can shrink and distort it; and receptive since the finisher can literally "impress" it with the desired finish. In the grey state the fabric, e.g. ribbon, contains yarn which, as a result of weaving, is under slight strain and is capable of shrinking to a slight extent. The most important quality of the yarn, however, is that it is thermoplastic, and any application of heat will set or fix it in the condition in which it happens to be during the application. What is more, this setting of the fabric in a certain shape—flat, creased, tangled, or knotted, as the case may be—will be in some degree permanent. If the heat treatment has been mild, then the fabric may be capable of being reset by a more severe heat treatment, and any damage can be remedied. If, however, the heat treatment has been fairly severe, e.g. in boiling water, then any deformation of the fabric will be permanent and the goods may be ruined.

These effects of setting imply that much greater care has to be taken in handling nylon goods, and that an additional process of setting, as early as possible in the sequence of operations, is highly desirable to avoid trouble. A nylon ribbon, if hanked, scoured, and beck-dyed in the same way as rayon, would emerge from the dyebath creased and folded in places as a result of mechanical action during dyeing. Such creases, inserted at a temperature of about 85°C. or possibly at the boil, would be extremely difficult, if not impossible, to remove, since the dyer has inadvertently "set" the fabric during dyeing, and only a prolonged steaming with pressure steam could rectify the fault. This is rarely possible, and in any case is undesirable.

The remedy is to take advantage of this property of setting and make it work for the dyer instead of against him. It will be clear from the above that setting is a relative term. A ribbon straight from the loom is unset. If it is scoured at 50–60°C. it receives a very mild set, and in boiling water it receives a fairly good set. The best set, however, comes from a drastic heat-treatment under conditions which will not be met again during subsequent processing or during the life of the ribbon. If such treatment is applied to the ribbon at the earliest possible stage of processing with the ribbon in a flat condition, then it can be handled afterwards in hank form without any danger of creases or deformation being fixed into the fabric. The dyer's task is, therefore, rendered much more trouble-free, and the subsequent article can be marketed without any fear of cause for complaint due to shrinkage, creasing, etc. during its normal life.

These setting effects are of great value both to the finisher, whose work is facilitated, and to the ribbon user. The reason for the ease of washing, quick drying, and need for little or no ironing of nylon is that the finisher has permanently set or laid the garment, with its accessories such as ribbon, lace, etc., in a flat condition, and it will remain so during washing. When it dries, it retains the full benefit of the finisher's treatment and does not really need any further ironing. Of course, a light pressing with a warm iron may freshen up a garment and can help to remove slight imperfections such as cockle at the sewings, where another fibre may have been used, but it cannot be said to be a necessity, as is the case with garments of silk, rayon, etc. Reference will be made later to this factor of permanence, which is one of the biggest advantages in the use of nylon.

#### METHODS OF PROCESSING

Ribbons up to 4 in. wide form the bulk of the ribbon trade. Masonic ribbons of widths up to 18 in. can be and are treated as broad-woven fabrics, and it is assumed that they do not come within the scope of this paper.

The ribbons are received from the manufacturer in rolls of 36 yd., and the first process is to hank them. This is carried out in the usual manner for all ribbons, and they are then scoured in the beck, preferably on bent tubes of stainless steel or plastics, giving complete immersion. Scouring is carried out with soap or detergent plus alkali, at a temperature of 50–60°C., and care should be taken at this stage to see that no undue rise of temperature takes place, which might set the creases in the ribbons. It is fortunate that nylon ribbons generally are in a clean condition, largely because of the speed of production, and they do not as a rule call for drastic scouring. Good soap or reliable detergent of a strength of 2–3 lb./100 gal. plus soda ash, metasilicate, or phosphate will suffice to remove all size, spinning finish, oils, etc., and will leave the fabric in good condition for dyeing. Stubborn oil stains may have to be hand-rubbed with concentrated solvent scours, e.g. Astol A (ICI), Imerol S (S), Teepol (Shell), etc. to name a few, and then resoured in the usual bath.

Although it has been mentioned that setting should take place as early as possible during the process, it is not usually advisable to practise it on the loom-state ribbons. Any dirt or soiling is apt to be fixed into the fabric by setting and may be difficult to remove afterwards. Also, certain sizes, e.g. Syncol (Allied Colloids), a polyacrylic substance, are fixed on the fibre by polymerisation and cause considerable stiffening, which is not removed by scouring. Moreover, by giving the fabric a mild scour as a first stage, weaving strains are relaxed and a more satisfactory handle results in the finished product. Grey setting, if possible, tends to give a wiry papery handle, because it sets the yarn in a strained condition.

The scoured hanks are hydroextracted, and dried by either stove or cans, when they are ready for setting. There are two or three possible methods for setting woven fabrics, but only one is really suitable and effective with ribbons. Boiling water can set a fabric reasonably well, but a prolonged immersion, actually at the boil with the ribbon in a flat condition, is not a practical proposition, at any rate to give good productivity. Steaming to be effective must be done under pressure, and there is no way of doing this as a continuous process, since pressures of 10–25 lb./sq.in. are desirable. Batching in rolls and treating in autoclaves could be used in certain cases, but this is an intermittent process, with poor production, and at any rate with ribbons it has serious limitations. Many ribbons have bold selvages which are much thicker than the body of the ribbon, and these cannot be batched to give a flat result. Also petershams, galloons, etc. would be liable to watering unless they were interleaved with cotton fabric as in decatizing.

With the elimination on practical or economic grounds of the water and steam methods, the remaining method of dry heat has proved to be the most suitable for setting nylon ribbons. This consists in running the ribbons over metal bowls heated to 400–420°F., to give a contact time of 10–20 sec. With two bowls, giving direct exposure of each side of the ribbon to the heating surface, a speed of 5–10 yd./min. is practicable, and by running several ribbons side by side to the maximum width of bowl excellent production is achieved with a high degree of set.

This principle is used for broad-woven fabrics in such machines as the Fairlawn in America, Belfour in Europe, and Bates in England. The last-named firm makes a small machine especially for ribbons, with bowls 12 in. wide and 8 in. in diameter. This machine can give a production of 2,000 yd. of 1-in. ribbon per hour if run continuously, and it is a simple matter to change from one order to another to cope with short runs. The temperature and the speed of passage (which determine contact time) are matters for experiment, in order to achieve the maximum set without oversetting, which would result in yellowing and partial degradation.

It is desirable to cool the ribbon as it leaves the bowls, and this is easily and quickly done by means of an air blast or a water-cooled roller.

Complete cooling is not essential, so long as the ribbon is brought below setting temperatures (i.e. to about 300°F.) whilst it is still flat. It can then be piled in trucks without any danger of distortion.

From this stage onwards the ribbons are treated by normal processes, i.e. rehanked, dyed, candied, and put over the finishing range.

The above sequence represents the safest method at present in use for nylon ribbons, if we wish to cover all eventualities, viz. short runs, frequent changes of shade, etc. It can justifiably be claimed that such a sequence is long and tedious and must inevitably add to the cost of processing. This is true, and in the case of short runs must be accepted. The processing has been described in this form to cover the worst that the finisher may have to endure, and the picture can be examined and modified to see where economies or short cuts may be permissible.

In the first place, narrow lingerie ribbons, up to  $\frac{3}{4}$  or  $\frac{1}{2}$  in. wide, can be scoured and dyed without setting, provided they are well woven and free from cockle, tight selvedges, etc. Such ribbons show no tendency to crease in the dye bath, and any slight curl is removed on the finishing range. It is essential, however, to stress that they must be well woven; otherwise, setting is necessary to straighten out inequalities. One big advantage of the ability of nylon to take a set is that such inequalities, due to uneven yarn shrinkage, yarn processing, winding, or warping, can be corrected by the finisher. It is right that, in these comparatively early days of nylon finishing, the finisher should do everything possible to assist in the production of satisfactory goods. It is not right, however, to expect him to spend time and money in trying to make presentable badly made fabrics, in which the fault should have been remedied at an earlier stage of manufacture. Where present, such defects can best be removed by close co-operation between manufacturer and finisher, if necessary with the encouragement and help of the yarn producer.

A second possibility for shortening processing time lies in continuous scouring. Where the fabric is fairly clean, plant similar to warp-dyeing machines for yarn may be used, provided that the scouring liquor can be well circulated or agitated. Such a scouring process, run in series with a few cans for drying and a hot-roll setting machine, can achieve very high production and deliver the nylon ribbons scoured, set, and dried ready for dyeing. A range such as is suggested above is made by the Bates Engineering Co. of Leicester. In such plant, since the ribbon is held straight and flat, under tension, the risk of creasing is removed, and the temperature of the scouring bath can be increased to 80–85°C. with advantage.

There is a third possibility in the sequence of operations—one which is finding increased favour in all fields of nylon finishing as the difficulties of handling the fibre are better understood and as experience is gained. This is the practice of post-setting, or setting the fabric as a last operation, after dyeing. Setting as early as possible is indeed

the best safety measure for anyone handling nylon for the first time. Where, however, the ribbon can be scoured and dyed in hank at low temperatures, e.g. 65°C., without undue creasing or tangling, it is possible to hydroextract, dry, and set as a last operation. The setting bowls may be coupled up to six or eight cans, or may be incorporated in the drying range. In order not to appear inconsistent, however, we must stress that this is a method for the more experienced finishers of nylon, and even then is preferably associated with long runs and possibly continuous dyeing of standard colours. The incidence of change of colour during post-setting must also be reckoned with and if necessary allowed for, since the high temperature used in setting will, if overdone, result in slight yellowing of the nylon, and possibly sublimation or alteration of disperse dyes.

The advantages of post-setting in economy of time and labour are obvious, but the attendant difficulties must not be overlooked. In the present state of our knowledge and experience of nylon-ribbon finishing, the process will be of more interest to the vertical concern than to the commission finisher, on whom the demands for exact reproduction are more insistent. The latter is called upon to process many small orders to individual requirements of shade and finish, rather than long runs to standard patterns.

#### DYEING

The actual dyeing of nylon presents few difficulties. Disperse dyes are used, and level dyeings in a complete range of shades are not hard to achieve. Most nylon yarn at present used in the ribbon-weaving industry is standard semi-dull yarn, and the lustreless appearance of the ribbon may be criticised. It is probable that bright yarns of suitable denier will shortly be available, and this should result in some stimulation of the demand for ribbons.

Dyeing is carried out either in the beck or on some form of hank-dyeing machine, of which the Hussong is the most suitable. The Pegg Pulsator machine gives a gentle action and adequate circulation to achieve levelness. In some cases frames in which the hanked ribbons are loosely held at each end are employed to minimise entangling.

It may be necessary to raise the cage during dyeing, in order to rearrange the hanks, since there is a tendency for several layers to cling together and so impede penetration. For this reason machines should not be overpacked, and the hanks should be as open as possible.

The practice of padding on dye with a very short immersion, and then can-drying, cannot be classed as dyeing, though it is used quite extensively in the narrow fabric trade. Continuous dyeing, on the lines of a warp-dyeing machine, will give longer immersion, but to give even the minimum for a full colour would mean very poor production. Also, colour matching requires very careful control.

#### BLEACHING

Bleaching of nylon may occasionally be necessary, as, for example, when setting has



resulted in yellowing of fabric which is required for whites. In such cases, sodium chlorite and peracetic acid are the most effective agents. They can be used in strengths up to 3 lb./100 gal., and if necessary at high temperatures, without danger of degradation. We must stress, however, that sodium chlorite is not without action on metals, even stainless steel, and its use is attended by risks of degradation of the plant. Wooden becks or earthenware vessels are quite suitable. No such restriction applies to peracetic acid, which can be used with impunity in most types of plant installed in dyehouses. Its storage life is rather short, but under the right conditions it is extremely useful and effective as a bleach for nylon.

The fluorescent brightening agents which find favour on a large scale today can be used on nylon ribbons. Most dyemakers market suitable brands, e.g. Tinopal (Gy), Blancol (LBH), Uvitex (CDC), etc., with different fluorescent tints. When used with discretion, they produce very attractive whites, but the practice of applying such agents to cover a yellowed nylon ribbon, rather than correcting it by bleaching, is to be deplored. Few of these brightening agents are fast to washing or sunlight, and when they fade to leave the ribbon a dingy yellow colour they probably do a disservice to the finisher. The remedy is in his own hands—to use them as improvers rather than to cover poor bleaching.

There are several examples of nylon ribbons of attractive design using dyed nylon yarn for stripes, spots, checks, etc. These yarns may be dyed with wool dyes (acid, chrome, metal-complex, etc.) or with disperse dyes. The finishing of such ribbons calls for a mild scour followed by setting, and care should be taken to see that the dyed yarn will stand heat-setting. Where bleaching is necessary to correct yellowing of the white, a mild peroxide scour or a peracetic acid treatment is safer than sodium chlorite. Both, however, should be used with care.

#### FINISHING

It is usual with rayon ribbons to finish with a pad treatment in starch, dextrin, gelatin, etc. followed by can drying. This imparts a slight firmness to the ribbon, if required, and it is usually demanded by the trade. It is not usual to give such a finish to nylon ribbons, which have a certain firmness or resilience as a result of setting. Where any additional finish is asked for, better results can be obtained on nylon with resins or polyvinyl acetate. These have more lasting qualities and also adhere more firmly to nylon, and such resins as BT 309 (BIP), Lyofix CH (CDC), and Bedafin (ICI) are excellent. They are, of course, more expensive, and if the effect sought is merely a selling point, the older and cheaper products can be used satisfactorily.

An important feature of nylon fabrics is their ability to take pure finishes with permanent results. Glazes or embossed finishes, under the right conditions, are completely permanent to washing and form a valuable addition to the number of attractive selling points which a finisher can supply. For ribbons the effect which has

always been in demand is the *moiré* finish, and whereas this can be applied without difficulty on rayon, it is removed by washing, and indeed can be spoilt by rain. For millinery ribbons this is a big drawback, which is satisfactorily overcome by the use of heat-embossed nylon.

For this process the ribbon should be dyed only, or at least given a comparatively mild set by reducing the temperature of the setting bowls. After dyeing and drying, the ribbon is embossed with engraved rollers heated to 350–400°F., and this gives a permanent embossed effect in addition to completing the degree of set. An alternative method, which gets over the difficulty of processing unset or lightly set fabric, is to scour the ribbon and then heat-emboss in the undyed state. If the embossing temperature is sufficiently high, such ribbons can be dyed afterwards, and no deterioration of the embossing will be experienced.

#### FUTURE POSSIBILITIES

Whilst the above processes are being used with success in many works, it is not claimed that they represent perfection from all points of view. There is a good deal of work to be done on all aspects of nylon finishing, and ribbons may well be included in this work.

Some interesting methods were evolved some years ago by Courtaulds Ltd., Droylsden, on the dyeing of ribbons, tapes, and webbing in the roll. The main object of this work was to solve the difficulty of lack of penetration of heavy webbing, and this was largely achieved by pressure circulating machines. It should be possible to use such machines for the setting and dyeing of nylon ribbons. The Brandwood machine, using totally enclosed circulation of dye liquor, and the Annicq machine, working on a similar principle, have been used for fabric dyeing on a considerable scale, and the idea should be capable of extension. If batches of ribbon, 144 yd. long, could be batched side by side to form 20 or 30 rolls interleaved with cotton wrappers, it should be possible to scour, set in boiling water for 30 min., and then dye the goods without removing them from the machine. On a large-diameter centre such as the cage of an Obermaier machine, a reasonable production could be expected. The practice and the economics of the process at any rate deserve consideration.

Continuous dyeing of ribbons is another aspect which may stand investigation, especially in view of the recent publications on this subject<sup>1</sup>, whilst pad-dyeing followed by heat-setting, on the lines of the Thermosol (DuP) process, could bring about a completely new outlook on the dyeing and finishing of nylon ribbons. They are certainly worthy of examination.

\* \* \*

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BRITISH NYLON SPINNERS LTD.  
PONTYPOOL  
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## COMMUNICATION

## The Combination of Wool with Acids

B. OLOFSSON

In reply to criticism by L. Peters, comparisons between different methods of calculating and predicting equilibrium constants ( $pK$ ) for exchange of  $Cl^-$  and  $SO_4^{2-}$  ions on wool are considered. The Gilbert-Rideal theory accounts for the experimental value of  $pK = 0.50-1.00$ , whereas the Donnan theory does not. The influence of swelling volume and ionic volumes, the meaning of  $pK > 0$ , the relationship between thermodynamic potential and  $pH$ , and the influence of the ionic strength are also discussed, providing further justification for the use of the Gilbert-Rideal theory. Thus the earlier conclusions of the author are in the main correct.

A previous issue of this *Journal* contains a paper by L. Peters<sup>1</sup> criticising an earlier paper by the present author<sup>2</sup>. His intention was to disprove my conclusion that experimental results regarding acid sorption on wool conform better with the Gilbert-Rideal theory than the Donnan theory. Now the paper by Peters<sup>1</sup> contains well justified calculations, but also little justified conclusions, and I find it important to give a reply. Space considerations compel me to make frequent references to previous papers. The symbols are those used before<sup>2</sup>.

## CRITICISM OF THE ACCURACY OF THE DATA

Peters's suggestion that the variations in my data arise principally from the  $Cl^-$  titrations seems to be correct. I have recalculated my values of  $pK$  (Table II, (a) and (c), p. 509<sup>2</sup>) using the formula—

$$[Cl^-]_e = c_{II} - 2c_{SO_4}$$

and found the values in Table I here. This correction reduces not only the standard deviations but also the mean values appreciably. The residual variance is not evidence of careless experiments.

## INCOMPLETE IONISATION OF SULPHURIC ACID

Peters has made extensive calculations on the influence of  $HSO_4^-$  formation. Of course, I have made such calculations myself, and my reason for neglecting this influence was explained in an earlier paper<sup>2</sup>. There I demonstrated (p. 62) how to calculate  $[HSO_4^-]$  and  $[SO_4^{2-}]$  in just the same manner as explained by Peters<sup>1</sup>, but I also showed how to calculate  $\theta_{H_2SO_4}$  according to the Gilbert-Rideal theory from the absorption curve for pure  $H_2SO_4$ , the affinity constant being taken from the high- $pH$  region of this curve, where the  $HSO_4^-$  concentration is negligible. It was found that  $\theta_{H_2SO_4}$  had rather small negative or positive values, and for this reason I neglected the formation of  $HSO_4^-$ . I also calculated  $[HSO_4^-]_i$  (p. 64, Fig. 5 and 6<sup>2</sup>) according to the Donnan theory, and found that the result was a decrease in the difference between experimental and theoretical plots. But I also showed that, if internal activity coefficients were considered, there was a trend in the opposite direction of about the same magnitude, and thus it seemed justifiable to neglect both  $HSO_4^-$  formation and internal activities in this case. Now, these conclusions are valid also for my later figures<sup>2</sup>. And I find it useful to decide here between different results of calculating  $pK$ , collected in Table I.

For the Gilbert-Rideal theory my value (0.52), as  $HSO_4^-$  formation is neglected, should be compared with Peters's value A (0.59), assuming the ratio between  $HSO_4^-$  and  $SO_4^{2-}$  concentrations to be the same in the fibre as in the solution phase, and Peters's value B (0.68), assuming the  $HSO_4^-$  and the  $Cl^-$  ions to have the same affinity for the fibre. The differences are not very important, proving the reasonableness of my approximation (my  $pK$  being smaller than Peters's).

For the Donnan theory, my value in Table I (0.81) should be compared with Peters's value (0.48). The difference in the methods of calculation is that I have neglected both  $HSO_4^-$  formation and internal activity coefficients, whereas Peters has neglected only activity coefficients. In the light of previous activity calculations (Table II (d)<sup>2</sup>) Peters's calculation gives a lower limit of  $pK$ , my value being a more acceptable mean.

In addition to this, I have also given in Table I values calculated from earlier experiments<sup>2</sup> on  $HCl + 0.1N-Na_2SO_4$  and  $H_2SO_4 + 0.1N-NaCl$ , using my calculation methods (a) and (c). All the values found are definitely positive, the  $H_2SO_4-NaCl$  values are in good agreement with previous values, and the  $HCl-Na_2SO_4$  values are larger.

Now the general conclusion is that, if all factors discussed are taken into consideration, both the Gilbert-Rideal method and the Donnan method of calculation give  $pK$  means  $> 0.50$  with standard deviations of 0.30–0.60, a large mean corresponding to a large deviation.

## THE STATISTICAL TESTS

After the remarkable observation that the positive values of all my figures make their significant deviation from the value zero immediately obvious, Peters gives a sort of lecture on statistics. He considers a very unrealistic example: of two theories, A gives a mean of 1.0 with a standard deviation of 1.4, whereas B gives a mean of 0.014 with a standard deviation of 0.005. If the mean expected in both cases is 0, the  $t$ -test gives a significance of about 20% for A and more than 99% for B. It does not follow that theory A is therefore superior to B, Peters says emphatically. The statistical conclusion is, of course, that in case B there probably exists a real difference between calculated and expected values, but in case A such a difference is very questionable. However, this example bears no relationship to my use of statistics, and Peters's further lecture on "selecting the best theory" is rather misleading.

From the values in Table I it is quite clear that there are no important differences between either the means or the standard deviations for the two theories (a) and (c). Thus it is not important whether internal activities are calculated as relative number of occupied sites (the Gilbert-Rideal theory) or as concentrations in the internal (swelling) volume (Donnan theory), a result that has been clearly stated by me earlier (p. 510<sup>2</sup>).

Peters does not seem to understand that my statistical test is only a method of confirming a conclusion, the validity of which is clear from an inspection of data. The difference between the Donnan and the Gilbert-Rideal treatment is not evident from comparisons of the pK means and variances calculated in Table I, but from comparisons of these values with pK values as estimated or predicted from the fundamentals of either theory.

## THE DONNAN THEORY

The calculation made by Peters has already been discussed, and the pK value found by him taken as a probable lower limit (Table I). Peters admits the significant deviation from zero, but as he lacks sound arguments he first suggests that there are residual uncorrected errors in the experimental results, and then gives a peculiar discussion of activity factors and  $\text{NaSO}_4^-$  formation. As explained above, I have shown that considerations of possible influence of activity factors everywhere lead to an increasing difference between calculated and predicted Donnan values. There is, firstly, no reason to suppose that  $\text{NaSO}_4^-$  formation will change this trend; neither does Peters attempt any sort of calculation. Secondly, the essential discussion here refers to mixtures of pure acids, where no Na is present.

TABLE I  
Calculated Values of pK

$$\text{pK} = -\log \frac{a_{\text{Cl},\text{H}^+} \times a_{\text{SO}_4^{2-}}}{a_{\text{Cl},\text{H}^+} \times a_{\text{SO}_4^{2-}}} \text{ (from (xii))}$$

from experiments by Olofsson

(a) according to the Gilbert-Rideal theory

(c) according to the Donnan theory

## CALCULATIONS BY OLOFSSON

Recalculated from Table I, p. 507 <sup>2</sup> ( $c_{\text{Cl}} = c_{\text{H}} - 2c_{\text{SO}_4}$ )			Calculated from Tables I-III, pp. 59, 61 <sup>2</sup> $\text{HCl} + 0.1 \text{ N-Na}_2\text{SO}_4$			Calculated as Difference between Pure Acid Values from Table I, p. 507 <sup>2</sup>	
Sample	(a)	(c)	Sample	(a)	(c)	Sample	
I 2	0.31	0.70	1	2.48	2.80	I 1- I 3	1.24
II 2	0.03	0.38	2	2.83	2.25	II 1- II 3	0.41
III 2	1.12	1.42	3	1.65	1.87	III 1-III 4	0.77
3	0.06	0.39	4	1.11	1.20	IV 1-IV 5	0.60
IV 2	0.54	0.77	5	1.06	1.02	V 1- V 5	1.20
3	0.39	0.66	6	1.41	1.12	VI 1- VI 6	1.76
4	0.34	0.62	Mean	1.76	1.70		
V 2	0.80	0.94	Standard deviation	0.74	0.72	Mean	1.00
3	0.65	0.90	$\text{H}_2\text{SO}_4 + 0.1 \text{ N-NaCl}$				
4	0.99	1.24		(a)	(c)		
VI 2	0.69	1.31	3	0.32	0.49		
3	0.52	0.72	4	0.86	0.82		
4	0.58	0.82	5	0.42	0.46		
5	0.20	0.53	6	0.34	0.35		
Mean	0.52	0.81	Mean	0.49	0.53		
Standard deviation	0.32	0.32	Standard deviation	0.25	0.20		

## CALCULATIONS BY PETERS

	(a) Table II, p. 440 <sup>1</sup> (A)	(c) Table I, p. 437 <sup>1</sup> $2 \log (\lambda_{\text{H}}/\lambda_{\text{Na}})$
Mean	0.69	0.48
Standard deviation	0.45	0.37

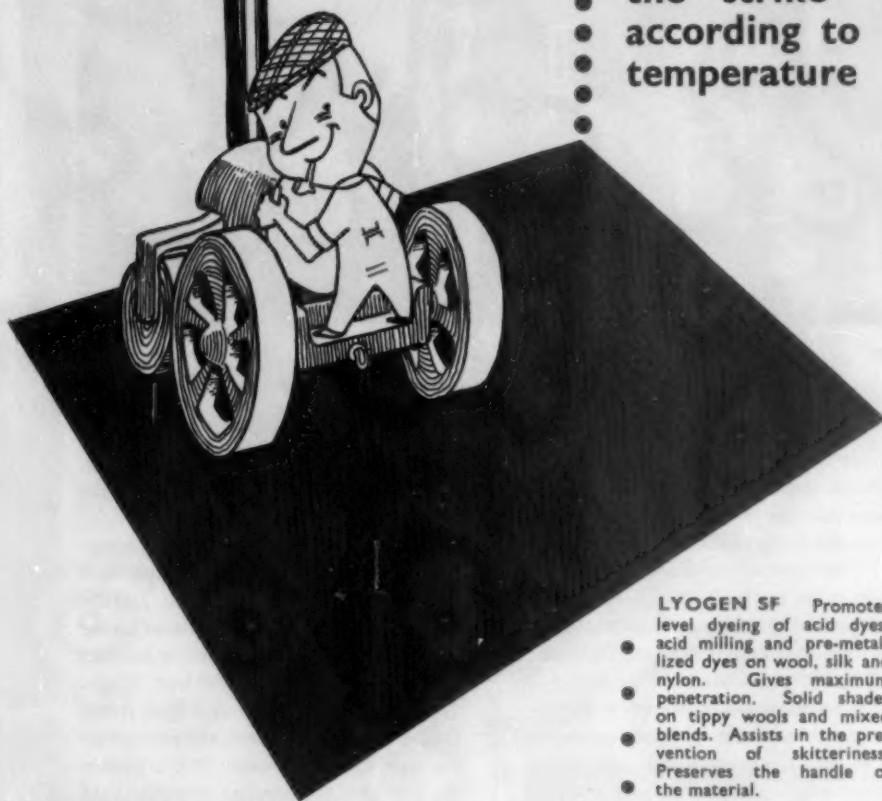


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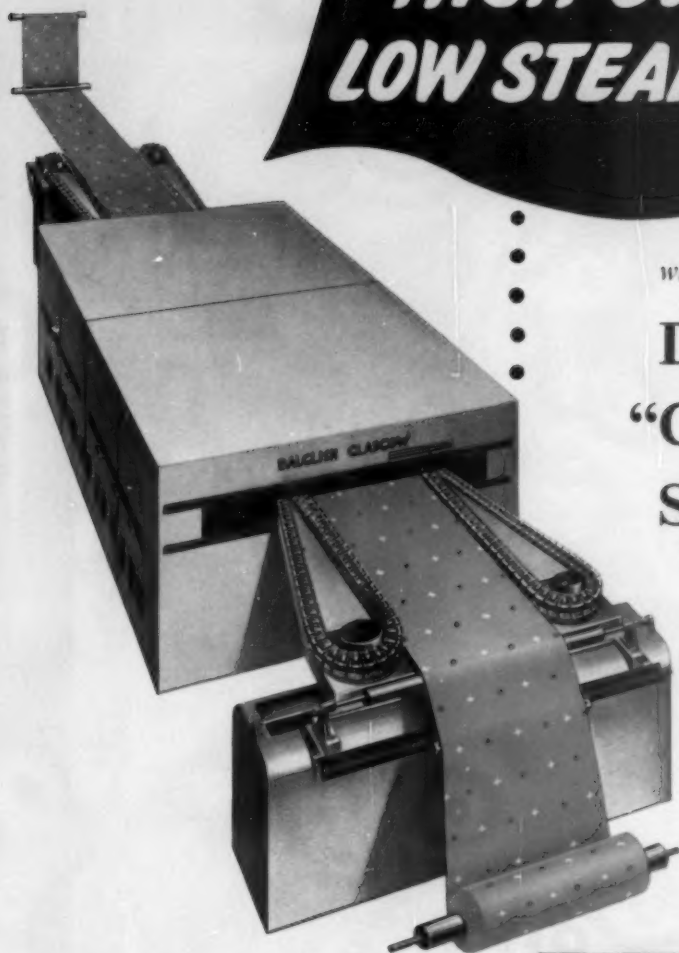
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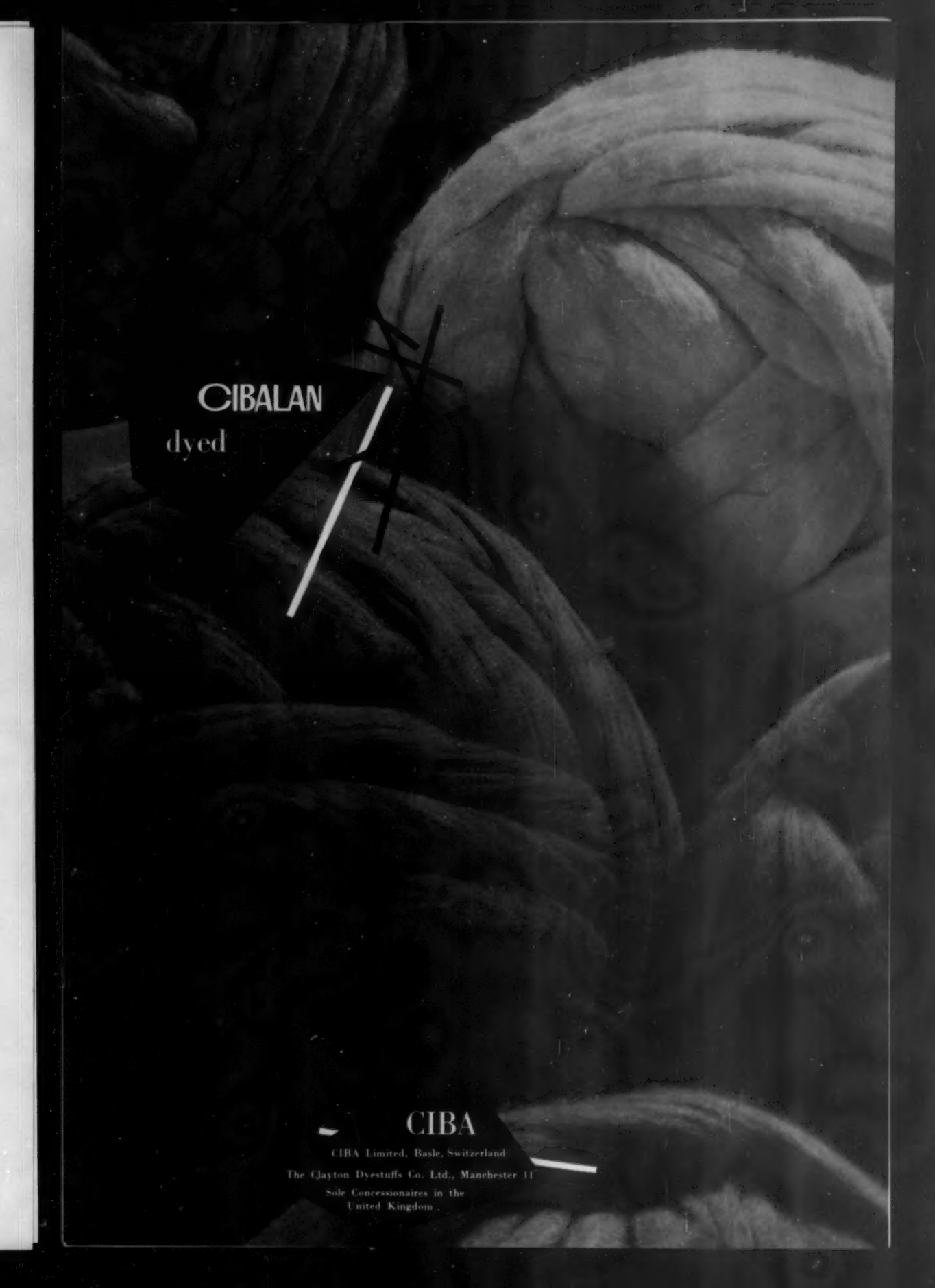


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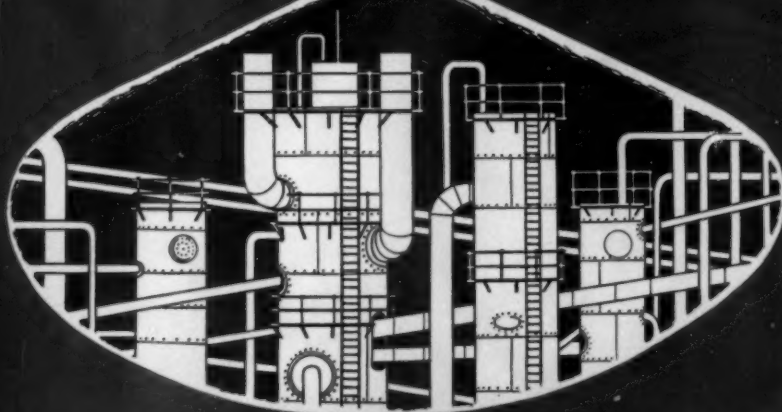
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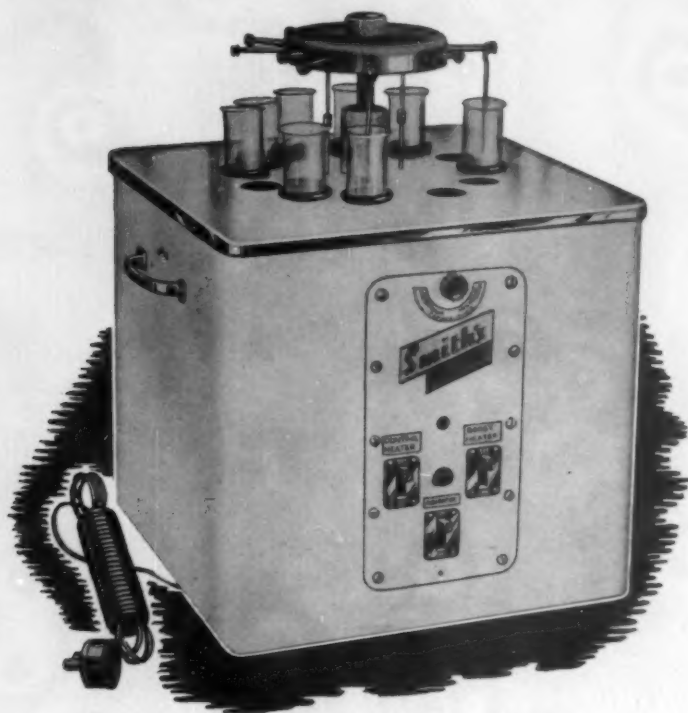
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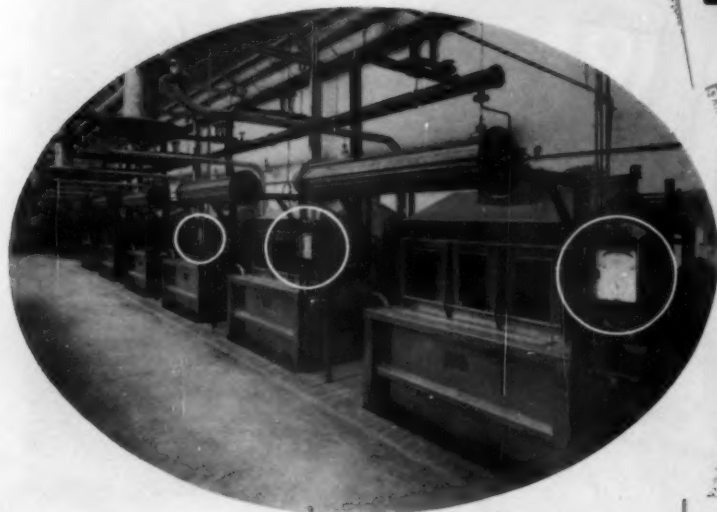
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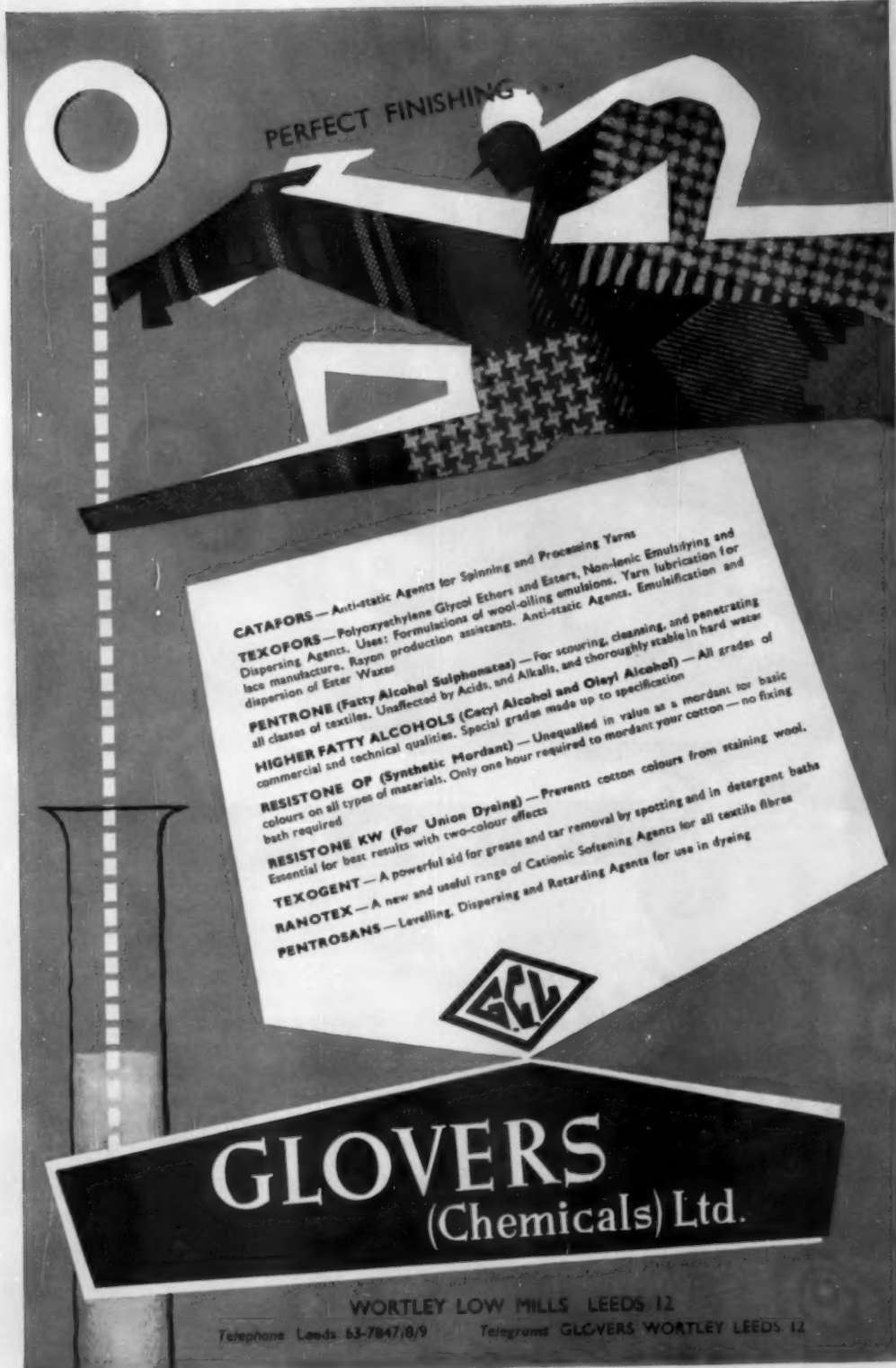


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## THE GILBERT-RIDEAL THEORY

The values of—

$$\Delta\mu_{\text{HCl}} = \Delta\mu_{\text{H}} + \Delta\mu_{\text{Cl}}$$

and

$$\Delta\mu_{\text{H}_2\text{SO}_4} = 2\Delta\mu_{\text{H}} + \Delta\mu_{\text{SO}_4}$$

for pure HCl and  $\text{H}_2\text{SO}_4$  both exhibit a definite trend with varying pH (or  $\theta_{\text{H}}$ ). These  $\Delta\mu$  values are easily calculated from experimental results for  $A_{\text{H}}$  (acid sorbed) or  $\theta_{\text{H}} = A_{\text{H}}/A_{\text{H max}}$  as a function of pH from equations (x)<sup>1</sup> and (xii)<sup>1</sup>. But this trend should be negligible for the pK values predicted, as it is negligible for the pK values in Table I.

Now there are several alternative ways of calculating—

$$pK = -\frac{\log e}{RT} \times (2\Delta\mu_{\text{HCl}} - \Delta\mu_{\text{H}_2\text{SO}_4})$$

Peters criticises me for taking simple averages over the pH range for  $\Delta\mu_{\text{HCl}}$  as well as  $\Delta\mu_{\text{H}_2\text{SO}_4}$  to get a pK mean. But Peters's first suggestion, to take  $\Delta\mu_{\text{HCl}}$  and  $\Delta\mu_{\text{H}_2\text{SO}_4}$  from the values of pH corresponding to  $\theta = 0.5$  for the two acids, has the same sort of limitation just because of the trend mentioned.

TABLE II

pH	2.0	2.5	3.0	3.5	4.0	4.5	
$-\frac{\log e}{RT} \times 2\Delta\mu_{\text{HCl}}$	8.90	9.19	9.60	10.06	10.52	11.05	
$-\frac{\log e}{RT} \times \Delta\mu_{\text{H}_2\text{SO}_4}$	8.10	8.40	8.83	9.30	9.77	10.12	
$\therefore$ pK	0.80	0.79	0.77	0.76	0.75	0.93	Mean 0.80

Peters's second suggestion, that pK be calculated as the difference between the  $\Delta\mu$  values at each pH, is in principle much to be preferred, though Peters's discussion of this point is not satisfactory. Such a method might be applied to the experimental results of other authors, not only my own very few results for pure acids listed in Table I (right-hand column). From the results of Steinhart *et al.*<sup>4</sup>  $\Delta\mu_{\text{HCl}}$  and  $\Delta\mu_{\text{H}_2\text{SO}_4}$  could be plotted against pH to give curves rather like those of Fig. 2<sup>1</sup>, but not so close together. From such curves we get the values (at 0°C.) in Table II, and we thus find that pK has an order of magnitude well comparable with the values calculated in Table I, and with a negligible trend.

However, we cannot exclude the possibility that the estimation should be made by calculating values of  $(2\Delta\mu_{\text{HCl}} - \Delta\mu_{\text{H}_2\text{SO}_4})$  at the same  $\theta_{\text{H}}$  for the two acids instead of at the same pH as above. On this basis we get just the types of curves given by Peters in Fig. 2<sup>1</sup>, and we could give the corresponding figures (Table III). This calculation gives

TABLE III

$\theta_{\text{H}} (= A_{\text{H}}/0.86)$	0.2	0.3	0.4	0.5	0.6	0.7	0.8
$-\frac{\log e}{RT} \times 2\Delta\mu_{\text{HCl}}$	9.67	9.36	9.15	9.02	8.92	8.86	8.83
$-\frac{\log e}{RT} \times \Delta\mu_{\text{H}_2\text{SO}_4}$	9.63	9.33	9.07	8.82	8.60	8.40	8.20
$\therefore$ pK	0.05	0.03	0.08	0.20	0.32	0.46	0.63

rather low values of pK, as well as a clear trend. But from a theoretical point of view I find no reason to exclude either of these methods or some average method.

Peters's estimation of the mean pK = 0.36 is reasonable, but evidently too low. My own previous estimation = 1.24 (Table II<sup>2</sup>) is too high, the main reason being that my value of  $\Delta\mu_{\text{H}_2\text{SO}_4}$  is too low, as Peters has noted. This was probably due to the fact that I made these calculations from published curves and not from the figures of Steinhart *et al.*<sup>4</sup>, which I obtained later on.

To demonstrate the Gilbert-Rideal prediction statistically, it would be preferable to give probability limits for the pK values calculated in Table I and show that the pK expected from the discussion here is quite consistent with the calculated figures. But this fact is evident without statistics.

The difficulty in estimating pK according to the Gilbert-Rideal theory is a consequence of the pH trend of the  $\Delta\mu$  values for the pure acids. But this trend is very well explained in Gilbert-Rideal terms, as shown later.

Peters has noted that my calculation on two-site fixation (Table II (b)<sup>2</sup>) holds only if the sites occur in pairs. I have observed this myself in a later paper<sup>6</sup>, and have also made a calculation using the considerations applied by Huggins to the thermodynamics of high-polymer solutions<sup>7</sup>. But this result is very questionable, as it assumes high coordination numbers for each site, an assumption that is probably not valid for wool keratin. I agree with Peters that we had better ignore two-site fixation until the statistical problem is solved.

## FURTHER CALCULATIONS ON THE THEORY OF ACID-WOOL COMBINATION

I find it important to consider some other significant questions before summarising the results.

## (a) Internal Volume (Donnan Theory)

We might possibly use as internal volume the total fibre-water volume ( $\approx 1$  ml./g. wool) instead of the swelling volume ( $\approx 0.3$  ml./g. wool). The internal concentrations will then decrease, and, as

is easily deduced, the  $pK$  values calculated will decrease by  $\log 0.3 = 0.51$ , i.e. the mean  $pK$  (cf. Table I) would be effectively zero, as predicted by the Donnan theory. But this physicochemical model does not seem to be realistic.

(b) *Volumes of Sorbed Ions (Donnan Theory)*

In a previous paper<sup>5</sup> I have discussed the influence of this factor and have calculated—

$$pK = -0.128 \times \log \frac{a_{H_2O, ext}}{a_{H_2O, int}} \quad (i)$$

It means that such a big ratio of water activity in the two phases as  $10^{\pm 1}$  would give the small deviation from 0 of  $\pm 0.13$  in  $pK$ , and  $pK > 0$  would mean that  $a_{H_2O, ext} < a_{H_2O, int}$ , which is very improbable.

(c) *Meaning of  $pK = -\frac{\log e}{RT} (2\Delta\mu_{Cl} - \Delta\mu_{SO_4})$  (Gilbert-Rideal Theory)*

This was also considered<sup>6</sup>, but is summarised here.

We write for the ion X—

$$\mu_X = RT \ln \frac{\theta_X}{1 - \theta_X} - RT \ln (p.f.)_X \times e^{E_X/RT} + z_X \times FV \quad (ii)$$

according to the formulation by Fowler and Guggenheim<sup>7</sup>, where  $(p.f.)_X$  is the internal partition function, including vibrational energy, and  $E_X$  is the evaporation energy. As—

$$\mu_X^0 = -RT \ln (p.f.)_X \times e^{E_X/RT}$$

and—

$$\Delta\mu_X = \mu_X^0 (\text{fibre}) - \mu_X^0 (\text{soln.})$$

we easily deduce that<sup>8</sup>—

$$pK = -\frac{\log e}{RT} (2\Delta E_{Cl} - \Delta E_{SO_4}) \quad (iii)$$

where  $\Delta E_{Cl}$  and  $\Delta E_{SO_4}$  are absorption energies for the ions. Now we could make the assumption that  $\Delta E_{Cl} \approx \Delta E_{SO_4}$ , as the absorption curves for the two acids do not differ very much and one-site fixations are probable in both cases. Thus—

$$pK = -\frac{\log e}{RT} \times \Delta E_{Cl}$$

and  $pK = 0.70$  gives  $\Delta E_{Cl} = \Delta E_{SO_4} = -875$  cal. This is reasonably low in relation to  $\Delta E_H \approx -5800$  cal., this result being derived from  $\Delta\mu$  values for the pure acids. However, it is also possible that the difference  $\Delta E_{Cl} - \Delta E_{SO_4}$  is significantly  $\neq 0$ , as there is evidence that the difference  $\Delta E_{Cl} - \Delta E_H \approx 390$  cal., a value calculated by Meggy<sup>8</sup> from  $pH \theta = 0.5$  for the pure HCl and HBr combination curves with wool. In the other paper<sup>6</sup> the comparability of the sorption energy for  $Cl^-$  and  $SO_4^{2-}$  ions and water molecules was pointed out, and the possibility of hydrated ions considered. Cationic hydration has subsequently been put forward by American workers<sup>9</sup> as a possible explanation of neutral-salt sorption. However, all experiments available<sup>2,4,10</sup> indicate a vanishing absorption of  $Na^+$  and  $K^+$  ions.

(d) *Relation between  $\Delta\mu$  and pH for Pure Acids (Gilbert-Rideal Theory)*

We have reason to suspect that the variation of  $\Delta\mu_{HCl}$  as well as that of  $\Delta\mu_{H_2SO_4}$  with  $pH$  or  $\theta_H$  is related to interaction between sites, as their mean distance should be  $\approx 6\text{\AA}$ .<sup>11</sup> An important calculation by Guggenheim<sup>7</sup> is applicable. We assume that there is an energy increase of  $2\omega_X/q$  when a new pair of occupied neighbouring sites is formed ( $q$  being the coordination number for each site). Such an energy increase lessens the probability that other neighbouring sites will be occupied. An approximate statistical treatment leads to a rather complicated formula, but as a further approximation  $2\omega_X/qRT$  is assumed to be small. We then expand in powers of this quantity, neglecting higher powers than the first, and get—

$$\mu_X = RT \ln \frac{\theta_X}{1 - \theta_X} + \mu_X^0 + z_X \times FV + 2\theta_X \omega_X \quad (iv)$$

If X is taken as respectively H, Cl,  $SO_4$  in (iv) and  $V$  is eliminated, we get relations for the pure acids, and we easily deduce that—

$$(\Delta\mu_H + \Delta\mu_{Cl})_{calc} = (\Delta\mu_H + \Delta\mu_{Cl})_{\theta=0} + 2\theta(\omega_H + \omega_{Cl}) \quad (v)$$

$$(2\Delta\mu_H + \Delta\mu_{SO_4})_{calc} = (2\Delta\mu_H + \Delta\mu_{SO_4})_{\theta=0} + 2\theta(2\omega_H + \omega_{SO_4}) \quad (vi)$$

Thus there should be a linear relationship between  $\Delta\mu$  values calculated in the usual manner and  $\theta$ . This is in excellent agreement with the principal type of curve drawn by Peters (Fig. 2<sup>1</sup>,  $A_H = \theta \times A_{H \max}$ ). Assuming that  $A_{H \max} = 0.86$  millimole/g. ( $2.3RT = RT/\log e = 1250$  cal./mole), we find from those curves that—

$$(2\Delta\mu_H + \Delta\mu_{SO_4})_{\theta=0} = -12,600 \text{ cal.}; 2\omega_H + \omega_{SO_4} = 980 \text{ cal.}$$

$$(2\Delta\mu_H + 2\Delta\mu_{Cl})_{\theta=0} = -12,800 \text{ cal.}; 2\omega_H + 2\omega_{Cl} = 1600 \text{ cal.}$$

The order of magnitude for the interaction energy as given by the  $\omega$ -values is very reasonable, the positive sign meaning that there is a repulsion between neighbouring sites occupied by ions with the same sign of charge. This type of calculation is also applicable for the Donnan case to account for the pH dependence of the keratin-acid dissociation constant.

(e) *Influence of Salts on  $\Delta\mu$  for Pure Acids (Gilbert-Rideal)*

The variation of  $\Delta\mu$  with ionic strength is another fact used by Peters as an objection to the Gilbert-Rideal theory. For HCl-KCl mixtures this variation is demonstrated in Fig. 3<sup>1</sup>. Now we first observe that a change of salt concentration from 0 to  $x$ -KCl will give a change in—

$$-\frac{\log e}{RT} \times (\Delta\mu_H + \Delta\mu_{Cl})$$

equal to  $4.52 - 4.39 = 0.13$ , which is a very small value (160 cal.) even in comparison with the interaction energy considered under (d). But Peters has not given the method of extrapolating the  $\Delta\mu$  values for the different ionic strengths. It would be of interest to use all the values obtained by Steinhardt *et al.*<sup>4</sup> at nine ionic strengths (0–1.0) and pH covering the absorption range for our discussion. Such plots of—

$$-\frac{\log e}{RT} (\Delta\mu_H + \Delta\mu_{Cl})$$



against  $\theta$  were made by the author, and gave the following result. The variance is large for large  $\theta$  ( $\log (\theta/1-\theta) \rightarrow \infty$ ). For  $\theta > 0.4$  no difference can be observed between the salt concentrations. As  $\theta$  further decreases from 0.4 there is an increasing difference between the ionic strengths but also an increasing variation of the individual ionic strengths; as  $\theta \rightarrow 0$ ,  $\log (\theta/1-\theta) \rightarrow -\infty$  and  $\Delta u$  is subject to large uncertainty. Thus the validity of Peters's points in Fig. 3<sup>1</sup> is rather questionable, though of course not refutable. But in every case the variation is of low significance, and if an explanation is required it is probably not more difficult in Gilbert-Rideal terms than in Donnan terms.

#### CONCLUSIONS

As shown here, the calculations by Peters<sup>1</sup> have in some cases modified the figures previously given by the author<sup>2</sup>, and the discussion has thrown more light on several essential points regarding the applicability of a solution (Donnan) or an absorption (Gilbert-Rideal) theory for the combination of acids with wool. But it has also shown that Peters's argument often obscures the results and that the conclusions drawn by the author are fundamentally correct. These are considerations to be taken into account when choosing between theories: their scientific adequacy and their practical applicability. The Gilbert-Rideal theory accounts for all experimental results considered here in a quite satisfactory way. The Donnan theory is scientifically inadequate in predicting  $pK = 0$  for the exchange equilibrium between simple anions, although all experimental  $pK$  values are significantly larger than 0, apparently 0.50-1.00. From the practical viewpoint a great advantage of the Gilbert-Rideal

theory is that the sorption isotherm for an acid is determined simply from the corresponding affinity constant (or an affinity ( $\Delta\mu_{\theta=0}$ ) + an interaction ( $\omega$ ) constant for more precise calculations). Such a prediction is not possible on the basis of the Donnan theory.

Perhaps the discrepancy between the theories is clarified by a more general theoretical approach recently made by White<sup>12</sup>, but here, again, the experimental material is not satisfactory.

\* \* \*

I thank Dr. N. Landqvist and Dr. M. Sandelius for helpful discussions and Professor N. Gralén for providing the opportunity to work out this reply. I also thank Mr. R. Stedman for revising the English text.

SWEDISH INSTITUTE FOR TEXTILE RESEARCH  
GOTHENBURG  
SWEDEN

(Received 11th February 1955)

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## CORRESPONDENCE

*The Editor does not hold himself responsible for opinions expressed by correspondents*

### Tests for Fastness to Washing

I do not quite see the point of the letter<sup>1</sup> regarding the Marney machine. When an examiner asks a candidate to describe an S.D.C. test as it is at the date of the examination, he does not expect to be given a description of what it will be six months later. If clairvoyant prognostications are to be

permitted to students, this examiner (who is not himself clairvoyant) would not know the answers to his own questions.

THE EXAMINER

27th November 1955

<sup>1</sup> McLaren, K., *J.S.D.C.*, **71**, 667 (Nov. 1955).

## Notes

### Meetings of Council and Committees December 1955

Council—No meeting  
Finance and General Purposes—12th  
Publications—20th  
Colour Index Editorial Panel—2nd  
Terms and Definitions—2nd

Dyers' Company Research Medal—7th  
Society's Medals—7th  
Perkin Social—13th  
Perkin Main—14th  
Textbooks and Monographs Subcommittee—20th

### Deaths

We regret to report the loss by death of Mr. A. Gardner, Mr. H. Hinchliffe, Mr. K. Stiasny, and Mr. Harold Taylor (of Bradford).

### Dyers Company Medal Committee

Mr. H. Hampson has succeeded Mr. G. S. J. White as Convener of the Worshipful Company of Dyers Research Medal Adjudication Committee.

### A.S.D.C. Examination

It is intended to hold an examination for the Associateship of the Society of Dyers and Colourists on Thursday-Saturday, 14-16th June 1956. Completed application forms (obtainable from the Society at 19 Piccadilly, BRADFORD 1, Yorkshire) must reach the Society not later than 31st March 1956.

### Fourth London Lecture

The fourth London Lecture will be given by Mr. James Laver (Keeper of the Departments of Textiles and Engraving, Illustrations, and Design of the Victoria and Albert Museum), his subject being *Colour in Fashion*. The lecture will be held at the Waldorf Hotel, Aldwych, on Friday, 20th April 1956, at 7 p.m.

### Dyers and Colourists Association of South Africa

Meetings are held by the Association on the last Friday of each month at the Royal Hotel, Durban.

During the past year a full programme of technical lectures has been held, in addition to two film shows. A highly successful cocktail party was held to give the wives of the members an idea of the company which their husbands kept at the monthly meetings.

At the Annual General Meeting, held on 26th August 1955, the following office bearers were elected—

Chairman	Mr. J. H. Allen
Vice-chairman	Mr. G. Slater
Secretary	Mr. E. Hipperson
Treasurer	Mr. E. Cullis
Office Bearers	Mr. W. T. Judge Mr. S. E. Cornah

A programme has been drawn up for the session ending in May 1956, and subjects to be covered include ancient dyeing practices, the effects of chrome compounds on wool, felt hat manufacture, and textile printing. The programme includes also a stag party.

### Library of the Chemical Society

The attention of members of our Society is drawn to their right to use this library and borrow books and periodicals from the very extensive collection of works on pure and applied chemistry. It appears that many members are not aware of this privilege (see p. 2 of this issue).

## OBITUARY NOTICE

### Arthur Clayton

Mr. Arthur Clayton received his early training at Broad Oak Printworks, Accrington, and joined Stead, McAlpine & Co. Ltd. in 1919 as Colourist. He later became Manager, and at the time of his death was Technical Director of his firm.

Throughout most of his working life he was associated with the production of furnishing fabrics both machine- and hand-printed. He was an authority on high-class block printing.

He was always glad to exhibit or to co-operate in the study of the remarkable historical collection of prints owned by his firm.

He was a founder member of the Cumberland and Border Textile Society and was active in local affairs. Whilst he was very interested in our Society, distance hampered any chance of notable activity in it. Those who knew him always found him quiet, unassuming, and with a subtle sense of humour.

His age was 62 and he is survived by a widow, a son, and a daughter.

J. W. REIDY

## New Books and Publications

### Clayton's The Theory of Emulsions and their Technical Treatment

Revised by C. G. Sumner. 5th edition 1954. Pp. viii + 669. London: J. & A. Churchill Ltd. Price, 72s. 0d.

Every worker on emulsions and surface activity knows Clayton's book; they also know its very high academic standard, remarkable in a subject so much one of applied science at the "cookery" level.

The much needed new edition revised by Dr. C. G. Sumner fully lives up to this high quality. It is a revision insofar as it follows generally the order and arrangement of earlier editions, yet it is almost a new book because of the large amount of new material included and of new topics such as the section on emulsion polymerisation.

After discussions of surface phenomena and adsorption at interfaces, the third chapter is

entitled "Dilute Emulsions as Oil Hydrosols". In this we find thorough treatment of electrical properties including the critical potential. Dr. Sumner is fully aware of the difference between oil hydrosols and concentrated emulsions, but I am not sure that he makes this fundamental point clear. Textbooks rarely do so when they are discussing the classical work of Powis and Ellis. The confusion arises from the definition of an emulsion as a liquid-in-liquid system—a definition which is sterile formalism at best, and at worst dangerously misleading, in that it hides the essential fact that true emulsions, or as Dr. Sumner calls them "concentrated emulsions", are not true colloids at all. Their particle size and high concentration (as hydrophobic systems) put them outside the upper size limit on the normal criteria of optical clarity and freedom from sedimentation.

Emulsifying agents are then described, and the main properties of emulsions treated thoroughly. A discussion of theories of emulsions is excellently done. Succeeding chapters deal with biological systems, technical emulsions, and emulsion polymerisation. The book is completed by three chapters on basic principles and technical operations in the preparation of emulsions.

This book will be of the highest value to all who are concerned with emulsions and interfacial problems, and is recommended without reservation. One hopes that it could be taken as a challenge to academic workers to increase the small amount of fundamental research so far reported in this field.

A. S. C. LAWRENCE

### Reports on the Progress of Applied Chemistry Volume XXXIX 1954

London: Society of Chemical Industry. [1955.]  
Pp. 1125. Price, 40s. 0d. (20s. 0d. to S.C.I. members).

This annual report is no less interesting than the previous volumes. It contains abundant factual information of progress made in the various branches of chemical industry. Many authors, specialists in their field, review the latest developments in inorganic and organic chemistry, in food and agriculture, in textiles, plastics, adhesives, and in chemical engineering and in the reduction of industrial hazards.

W. F. Roff (British Cotton Industry Research Association) reviews the treatment of cellulose textiles with chemical finishes of the cross-linking type and the use of aminoaldehydes in crease-resist finishes. In conclusion the author pleads that more careful attention should be paid to the choice of some of the descriptive terms employed in this branch of textile chemistry. For water-soluble impregnants not "resins" or "resin solutions" but *precondensate* or *impregnant* should be used, and the final product should be called *urea-formaldehyde* (or other amino-aldehyde) rather than "resin" or "urea-formaldehyde resin". There still exists confusion about terminology in many branches of textile processing, and it is to be hoped that the Terms and Definitions Committees of the Society and the Textile Institute

will soon publish further recommendations on textile terminology, and that industry will not only acclaim, but adopt them.

The determination of the functional groups of cellulosic materials is discussed by K. Jelly (B.C.I.R.A.), and F. O. Howitt (Wool Industries Research Association) reports on the progress made in protein fibres. Of particular interest is the section on synthetic fibres, with chapters on Acrylic Fibres (E. I. Jones), on Polyamides (O. B. Edgar), and on Polyesters (N. Munro). The chapter on textile finishing (A. J. Hall) deals with progress made in bleaching, dyeing, printing, and finishing of natural and man-made fibres. It is a brief review (8 pages), probably in view of the pending publication of the *Review of Textile Progress*, which will cover more fully the developments of the past year. The author mentions particularly the new dyeing and printing methods for synthetic fibres; to the list of references the very instructive publications *The Dyeing of Terylene Polyester Fibre* (ICI) and *A New Process for Black on Terylene Loose Staple, Stubbing, and Yarn* (ICI) should be added.

Members of the Plastics Group of the S.C.I. contribute to the chapter on plastics, and H. Steiner reports in his review a general expansion of production of organic chemicals, particularly of ethylene, polyethylene, and propylene in Britain, in the U.S.A., and on the Continent; of not less importance is the development of monomers, particularly styrene, butadiene, vinyl chloride, methacrylic esters, and acrylonitrile in the plastics and textile industry. H. E. Nursten reports, in 60 pages, on developments in intermediates and dyes. K. Burrow states that the use of synthetic detergents in Britain continues to expand largely at the expense of soap, and he reviews recent publications on the physical properties of detergents, raw materials, manufacturing processes, additives, and analytical testing methods for synthetic detergents. To the list of recent books he might wish to add the work by K. Lindner *Textilhilfsmittel: Waschrohstoffe* (Stuttgart: Wissenschaftliche Verlags-Gesellschaft, 1954), which was recently reviewed in this *Journal*.

As usual, the author and subject indexes are well compiled, and there is a list of patents and literature at the end of each chapter. It is an indispensable reference book.

A. F. KERTESS

### Analytical Chemistry—The Working Tools

Edited by C. R. N. Strouts, J. H. Gilfillan, and H. N. Wilson. Two volumes. 1955. Pp. (1) xxiv + 1-494, (2) ix + 495-1067. London: Oxford University Press. Price, 105s. 0d.

The Analytical Chemists Committee of Imperial Chemical Industries Ltd., which was formed in 1928, had as one of its primary objectives the unification of analytical procedures throughout the Company; the present volumes are the realisation of that objective. This is at once a statement of the scope and of the limitations of this work, and although it is not comprehensive, the numerous methods that are described and discussed have



proved their reliability in an organisation that is so vast as to be a proving ground of unsurpassed resource.

Volume I contains fifteen chapters—Accuracy of Analysis, Manipulation; Sampling (the sub-sections of which include: liquids, solids, wet pastes and slurries, and fibrous materials); Weighing; Calibration and Use of Volumetric Apparatus; Measurement of Temperature and Pressure, and of Density and Specific Gravity; Determination of Crystallising Point and Melting Point; Distillation and the Determination of Distillation Range; Reagents and Indicators; Determination of pH; Standardisation of Volumetric Solutions; Quantitative Ultimate Organic Analysis; Quantitative Organic Microanalysis; Gas Analysis. Volume 2 contains a further thirteen chapters—Potentiometric Titration; Conductometric Analysis; Polarography; Electrodeposition; Introduction to Colorimetric Analysis, Ultraviolet and Infrared Absorption Spectrophotometry; Colorimetric Analysis; Ultraviolet Absorption Spectrophotometry; Infrared Absorption Spectrophotometry; Emission Spectrography; X-Ray Spectrographic Analysis; X-Ray Diffraction;

Chromatography; Application of Statistical Methods to Chemical Analysis. Microscopy and the Determination of Viscosity appear at the end, in the form of a selected bibliography.

The overall treatment is excellent, particularly the policy of unifying and defining terms, and providing a full and lucid exposition of the theoretical background; these virtues could well be put to good use by many other authors. Because of the speed of development of certain subjects, this book lags behind the published literature—this is, of course, inevitable—to a serious extent. Thus, the section on chromatography, for instance, takes no account of two-dimensional methods, or of circular paper chromatography.

The two volumes are beautifully printed on good paper, the binding is serviceable, and errors and omissions are few—though the caption to Fig. 12, on p. 177, "Apparatus for distillation under" might well lead the reader to reply, with Lewis Carroll, "The little fishes' answer was, we cannot do it sir, because . . .". Nevertheless, analysts will have to think at least a second time to find a better way of spending the next five guineas.

J. W. DUARTE

## Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be referred to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University

### Ciba Ltd.

**ALIZARINE FAST FUCHSINE RL**—This acid dye may be applied from acetic acid, ammonium sulphate, or neutral solution to wool, polyamide fibres, and silk to give bright red-violeta of good wet fastness. On wool it is suitable for use alone and in mixtures on knitting yarns and cloth. It is very suitable for shading Cibalan and chrome dyeings and is of interest for dyeing the wool portion of wool-cellulosic fibre mixtures. It has a high saturation value on polyamide fibres. Fastness figures on wool include—Light 6, washing (a) 4-5, perspiration 3-4.

**CIBALAN BRILLIANT BLUE GL**—The Cibalan Brilliant dyes are neutral-dyeing acid dyes primarily intended to supplement the Cibalan range of neutral-dyeing pre-metallised dyes by providing on wool and polyamide fibres the bright colours at present unobtainable with the latter alone. Thus Cibalan Brilliant Blue GL gives bright blues and is of interest alone and particularly when used in conjunction with the Cibalan range, and with Cibalan Brilliant Yellow 3GL, the first member of the Cibalan Brilliant range. Fastness figures on wool include—Light 6, alkaline milling (b) 3, washing (b) 3-4.

**MICRO DISPERSE CIBANONE DYES IN COTTON DYEING**—This booklet describes the properties and uses of a range of 15 Cibane vat dyes now available as Micro Disperse Pastes and Powders in which the particle size has been reduced to 0.2-1.0  $\mu$ . Dyes of such fineness are particularly suitable for application by pigmentation methods, and such methods are described in detail. The Williams unit, the hot-oil process using a modified Williams unit, and the Standfast molten-metal process are also described; photographs of machines and plant, plant layout diagrams, and a selection of photomicrographs of various brands of vat dyes are also included.

**UVITEX U**—This is a fluorescent brightening agent primarily intended for use on polyester and polyacrylonitrile fibres, but is of general interest on a very wide range of fibres to which it may be applied from a neutral or weakly alkaline solution.

### The Geigy Co. Ltd.

**CUPROPHENYL GREEN BL**—This direct dye gives greens having excellent fastness to light and wet treatments when applied to cellulosic materials and aftertreated on the fibre with copper sulphate. It is suitable for dyeing materials subsequently to be crease-resisted and is of interest for dyeing wool-cellulosic fibre mixtures. Good reservation of acetate rayon is obtained in pale to medium depths. Fastness figures for an aftertreated dyeing on viscose rayon include—Light 6, washing (b) (60°C.) 3-4, perspiration 5.

**DIPHENYL FAST NAVY BLUE AB**—This direct dye gives navies of good fastness to light on cotton and viscose rayon, a feature being the increase in light fastness which is produced by anti-crease finishing. A further advantage is that dyeings on viscose rayon have good fastness to water, and thus aftertreatment to improve wet fastness is not normally required. It is readily dischargeable and is particularly suitable for white discharge styles on dress cloths and tie fabrics. Fastness figures on viscose rayon include—Light 4-5 (crease-resisted dyeing 5-6), washing (a) (40°C.) 5, perspiration 3-4.

**IRGALAN DYES**—The latest Irgalan pattern card contains dyeings on wool cloth in ten depths of 20 Irgalan neutral-dyeing premetallised dyes and 4 Irganol neutral-dyeing acid dyes designed to provide the very bright colours, which as yet are unobtainable with the Irgalan dyes alone. Dyeings in eight depths of 36 two- and three-colour mixtures are also included. The text includes a description of the Geigy high-temperature dyeing method, which "is designed to overcome the need for careful temperature control in dyeing". Using this method, the material is first treated in a solution containing the requisite amount of ammonium sulphate or acetic acid to give a starting pH of 6-7. The temperature is raised rapidly to 90-98°C., 1% Irgasol DA or 0.5-1% acetic acid (40%) plus 1% Tinegal NA are added, and the material is treated for a further 5 min. The dissolved dye is then added, dyeing continued in the cooling solution for



a further 10 min., the temperature then raised to boiling point within 10 min., and dyeing continued at the boil for 20-40 min. Irgasol DA and Tinagal NA are recommended as retarding agents. Additional dye for shading may be added with the steam turned off, but when acetic acid is present without retarding agent it is recommended that the dyebath be cooled to 60-70°C.

**SOLOPHENYL BROWNS**—This card contains dyeings on cotton cloth of 7 homogeneous fast-to-light direct dyes. Dyeings in six depths are shown and, in addition, 18 mixture dyeings. Having the advantages of excellent compatibility and dyeing properties which are easily controllable under most dyeing conditions, this group of dyes is particularly suitable for producing browns and greys having very good fastness characteristics.

### Imperial Chemical Industries Ltd.

**DYES FOR NYLON TEXTILES: DISPERSOL, DURANOL, AND MULTAMINE DYES**—This card contains dyeings on nylon cloth (wince-dyed at 85°C.) of 30 disperse dyes from the Duranol and Dispersol ranges and 13 specially prepared mixtures for dyeing nylon, marketed as Multamine dyes. The usual comprehensive selection of fastness data is appended, including crease-resist finishing, dry heat setting, pleating, and rubberproofing, details of the testing method being included for the last three.

**DYES FOR NYLON HOSE**—This card contains dyeings on hose prepared from multifilament nylon yarn of 8 disperse dyes selected from the Dispersol, Duranol, and Multamine ranges, Rufasol Black BS, and Solochrome Black W DFA. Six mixture dyeings are also included, and recipes are given for matching them with Duranol and Dispersol dyes, Multamine dyes, and Duranol and Dispersol dyes giving dyeings fast to post-boarding using dry heat. The text includes details of the dyeing and finishing of nylon hose including anti-sag finishing using Calatac MMP, followed by Calatac VA where a firmer finish is required.

**ICYL DYES FOR IRREGULARLY DYEING VISCOSE RAYON**—This card contains dyeings on continuous-filament viscose rayon cloth of 24 direct dyes selected for their ability to give level dyeings on continuous-filament viscose rayon which, as a result of certain factors associated with its manufacture, is liable to be dyed unevenly with many dyes. This range, marketed as the Icyd dyes, has been considerably extended, so that it is now possible to obtain well penetrated dyeings virtually free from irregular affinity defects on all types of filament viscose rayon yarn and cloth and in a wide range of colours. A dozen typical mixture dyeings are also included.

**PROPOLAN RED 3G**—This acid dye gives slightly bluish reds on wool, regenerated protein fibres, and nylon. On wool it behaves as a level-dyeing dye but gives dyeings having better fastness to washing and perspiration than the ordinary level-dyeing type. This, together with high light fastness, makes it very suitable for use alone and in mixtures with Propolan Yellow 3G and Solway Blue 2G on yarn and cloth. Further, because it covers all but the most serious types of wool damage, it is very useful as the red component on carbonised wool. It is of only limited interest for textile printing. Fastness figures on wool include—Light 6, washing (mild, once at 40°C.) 4, perspiration (pattern at pH 7-8) 2.

**THE DYEING OF WOOL AT HIGH TEMPERATURES**—This technical circular contains the results of experiments (carried out as far as possible in a commercial, single-package, high-temperature dyeing machine) designed to determine the effect of dyeing wool above 100°C. on (a) the dyeing characteristics of the dyes, (b) the time required for dyeing, and (c) wool quality. On the basis of these results, the maximum temperature recommended is 110°C., the dyeing time not to exceed 1 hr. Dyes which are unaffected in either hue or depth must be used and, in the case of the fast-to-milling acid dyes, the dye solution should remain faintly acid throughout. With the afterchrome process, 5-10 min. chroming at 105-110°C. is sufficient. If these conditions are satisfied, satisfactory dyeings may be obtained on all types of wool goods with minimum effort and a saving in time.

**TECHNICAL INFORMATION LEAFLETS—Dyehouse No. 260. The Effect of Fixanol PN on the Shade and Fastness Properties of Icyd Dyestuffs**—Figures are given for the fastness to light, water, and repeated mild washing (5 times at 40°C.) of untreated and Fixanol PN-treated dyeings on viscose rayon of the complete range of Icyd dyes. Fixanol PN may also be added with advantage to the last rinsing water to prevent migration during drying and marking off during subsequent finishing.

**Dyehouse No. 262. Sterilisation of Hospital Blankets**—This describes the use of the cation-active product, Cirrasol OD, as a bactericide. Prior washing in a solution of a non-ionic detergent (Lissapol N) is essential in order to remove traces of anionic detergent present, which would otherwise form anionic-cationic complexes having little or no bactericidal action.

**Dyehouse No. 263. The Application of Caledon Dyestuffs to Ardil Fibre B—Cellulosic Fibre Unions**—Existing published recommendations for dyeing Ardil fibre-cellulosic fibre mixtures with vat dyes are now obsolete, since it has been found that such mixtures may be dyed by the methods normally used for 100% cotton or viscose rayon materials provided that they are left in a slightly acid condition before drying. A recommended procedure is: dye as for cotton, oxidise, sour in dilute acid, and "acop" neutral with a synthetic detergent. A list is given of 10 Caledon dyes giving solid dyeings on Ardil Fibre B-cotton mixtures.

**Dyehouse No. 265. Fixanol PN for improving the Perspiration Fastness of Direct Dyestuffs on Chrome-tanned Leather**—This leaflet describes the results obtained when the fastness to perspiration of dyeings of a range of direct dyes on full chrome calf and full chrome sheep aftertreated with Fixanol PN was determined using a test based on that described in the *Second Report of the Fastness Tests Committee* (2nd edition 1950).

**Dyehouse No. 266 (replaces No. 245). Weathering Fastness: Vat and Azoic Dyestuffs**—Figures for the "weathering" fastness of standard-depth dyeings of 77 Caledon dyes and deep dyeings of 37 selected Brenthol combinations are given.

**Dyehouse No. 267. The Effect of Quintolan W on Viscose Rayon dyed with Direct Dyes suitable for Crease-resist Work**—Figures are given for the effect on hue and light fastness of aftertreating with Quintolan W dyeings of 40 direct dyes on staple viscose rayon. In all cases the hue was affected and in the majority the change was considerable. In nine instances the light fastness was unaffected, and in a further sixteen it was slightly reduced.

**Dyehouse No. 268. The Dyeing of Terylene Polyester Fibre: Supplement No. 5**—This describes a new process, analogous to that used to produce a black with Dispersol Diazo Black B and Brenthol OT, for navy blues on loose staple fibre, slubbing, and yarn using Brenthol FO and Brentamine Fast Blue B. A dyeing temperature of 125-130°C. is essential.

**Dyehouse No. 269. Icyd Dyestuffs: Suitability for Urea-Formaldehyde Crease-resist Finishing**—Details are given of the effect of a typical urea-formaldehyde crease-resist finish on the hue and light fastness of dyeings on spun viscose rayon staple cloth of the complete range of Icyd dyes.

**Dyehouse No. 270. The Dyeing of Cellulose Triacetate: Supplement No. 1. The Selection of Disperse Dyes**—The information given in this leaflet amplifies and supersedes that given in Dyehouse No. 243. Figures are given for the fastness of selected disperse dyes to light, to various wet treatments, and to dry heat and steam setting, dyed on bright, continuous-filament Courpleta (Courtaulds) yarn.

**Dyehouse No. 271. Wool and Worsted Color Card of America: 1956 Spring and Summer.**

**Technical Information Index: Rubber.**

**Rubber No. 32. Cellular GR-S.**

**Rubber No. 33. Cellular Neoprene.**

**Rubber No. 34. The Antioxidant and Anti-flexcracking Properties of Vulcanard A.**

**Rubber No. 35. Vulcanoprene A: Proofing Compounds.**

**AGING AND WEATHERING OF RUBBER**—This is a reprint of a paper by J. M. Buist from *Rubber Chemistry and Technology*, 28, 230 (1955).

**THE FASTNESS ASSESSMENT OF TEXTILE DYESTUFFS** (2ND EDITION 1954)—The first edition of this manual appeared in 1946. In this edition, a number of tests have been replaced by those recommended by the colour fastness subcommittee set up by the International Organisation for Standardisation. Others have been modified in the light of the experience gained. To avoid needless repetition of tests common to several fibres and the introduction of special sections to cover each of the newer fibres, e.g. Terylene, an alphabetical arrangement has been introduced. Two series of standard depth, one for wool and the other for other fibres, plus two supplementary series for Soledons and Brenthols, were originally prescribed. These have been replaced by one series intermediate in depth, a second series in pale colours for all tests on Soledon dyeings and other special cases, and a third for Brenthols. The printed, coloured reproductions of the series used in the first edition have been replaced by actual dyeings on wool and on cotton for the Brenthol series. Fastness to light is now determined according to B.S.1006:1955. The colour plates introduced in an attempt to illustrate the effect of the test on the hue and depth of colour of the pattern and to assess the degree of staining have been replaced by the internationally accepted Geometric Grey Scales, copies of which are provided. The three test controls, showing Grade 5, 3, and 1 effects, have been replaced by a single one showing the Grade 3 effect, and only one control on a specific fibre is recommended irrespective of the material being tested. The test control dyes have been chosen to show the required effect on the pattern and also to reflect small changes in testing conditions. Forty-three test specifications are given.

#### VEB Farbenfabrik Wolfen

VEGAN, VEGAN FAST, and VEGAN METACHROME DYES—This card (German text only) contains dyeings of 88 dyes

on 50 : 50 wool-cotton mixture cloth and a further 27 dyeings of mixtures of them. The dyes described include selected members of the Solamin and Solamin Fast ranges, the Vegan, Vegan Fast, and Vegan Metachrome ranges, and also two small groups of acid and direct dyes for dyeing the wool and the cellulosic portions only, and a further group of direct dyes suitable for diazotisation and development on the fibre.

**VEGAN FAST GREY B**—This union dye gives bluish greys and is recommended for use alone and in mixtures on all types of protein fibre-cellulosic fibre mixtures. Aftertreatment with Wofafix WWS improves the fastness of dyeings to wet treatments. Fastness figures of a dyeing on wool-cotton mixture cloth include—Light 4-5, washing (a) (40°C.) 4 (aftertreated with Wofafix WWS, 5), perspiration 3.

**VEGAN FAST YELLOW 5G**—This union dye gives bright greenish yellows on protein fibre-cellulosic fibre mixtures. It has similar properties to the Grey B described above. Fastness figures on a wool-cotton mixture cloth include—Light 5-6, washing (a) (40°C.) 3, perspiration 2.

**DISCHARGE PRINTS ON COTTON**—This card (German text only) contains neutral and alkaline discharges of dyeings of 44 direct dyes on cotton cloth. The dyes described include Solamin and Solamin Fast, selected direct, and diazotised and developed types.

**SOLAMIN FAST YELLOW 5G**—This direct dye gives bright greenish yellows on cellulosic fibres. Fastness figures on cotton include—Light 5, washing (a) (40°C.) 3, perspiration 2.

**SOLAMIN RED 4B**—This very level-dyeing direct dye gives bright bluish reds on cellulosic fibres. It is also of interest on polyamide fibres and wool-cellulosic fibre mixtures. Dyeings are dischargeable to a good white under both neutral and alkaline conditions. Fastness figures on cotton include—Light 5, washing (a) (40°C.) 2, perspiration 1.

## Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., 68, 23 (Jan. 1952), and also, together with symbols and the periodicals abstracted, in the annual index

### I—PLANT; MACHINERY; BUILDINGS

#### Unit Processes in Chemical Engineering—Annual Review

*Ind. Eng. Chem.*, 47, 1825-1943 (Sept. 1955, Part II)

Reviews are presented of developments in 1954 in the following subjects—alkylation, amination by reduction, decomposition of hydrocarbons, esterification, fermentation, halogenation, hydrogenation and hydrogenolysis, isomerisation, nitration, oxidation, polymerisation, pyrolysis of coal and shale, sulphonation and sulphation, and Friedel-Crafts reactions. W.K.R.

#### Removal of Hydrogen Sulphide from Exhaust Air from a Viscose Staple Fibre Factory

D. C. F. Pratt and A. Rutherford

*Chem. and Ind.*, 1281-1286 (8 Oct. 1955)

Hydrogen sulphide is removed from the exhaust fumes of viscose manufacture by scrubbing with an alkaline soln. and subsequently oxidising the adsorbed sulphide to sulphur by aeration in the presence of hydrated ferric oxide catalyst (Ferrox process). Thiosulphate, sulphate, polysulphide, and sulphite are formed simultaneously. It is shown that the following requirements are needed for the two processes, some of them contradictory: (a) for efficient scrubbing—(i) high alkalinity, (ii) large liquor surface area, (iii) low content of dissolved salts; (b) for oxidation and regeneration of catalyst—(i) low alkalinity, (ii) low rate of aeration, (iii) low thiosulphate content, (iv) high catalyst content, (v) high oxygen transfer rate. Pilot-plant work and the subsequent design of an efficient full-scale plant which lowers the H<sub>2</sub>S content of the air from 300 to 10-20 p.p.m. and also removes 50-70 p.p.m. of CS<sub>2</sub> are described. A.J.

#### Dyeing and Finishing Rayon-tufted Carpets

J. A. Woodruff

*Amer. Dyestuff Rep.*, 44, P 636-P 640 (29 Aug. 1955)

Problems of dyeing and finishing rayon-tufted carpets under conditions where 1,500 lb. of goods is dyed at once are discussed, mainly with reference to machine improvements to ensure optimum circulation. Mention is made also of dye selection and faults. J.W.B.

#### PATENTS

#### Drying Material on a Moving Belt by Heat Radiation

FB:

BP 740,030

#### Continuous Treatment of Filaments or Yarn

S.r.l. Studi e Brevetti Applicazioni Tessili

BP 739,178

A very compact thread storing, thread advancing device on which the yarn can be subjected to various treatments. C.O.C.

#### Drying Rayon Cakes

Celanese Corp. of America

USP 2,698,488

The cakes are subjected to a high frequency electrical field while being treated with air at 50% R.H. at a velocity of 75 ft. per min. and a dry bulb temperature of 140°F. This gives yarn of low and uniform residual shrinkage. C.O.C.

#### Moistening Rotatable Packages such as Yarn Cops or Bobbins

Schweizerische Lokomotiv- und Maschinenfabrik

BP 739,130

Cops or bobbins of yarn are fed through a hopper on to a system of distributing and conveying discs or to a conveyor which passes the bobbins forward in the direction of their axes while at the same time rotating them about the axes.

A sprinkler system wets the bobbins evenly, the wetting being controlled by the conveying and rotational speeds, the latter being high enough to remove excess liquid by centrifugal force. J.W.B.

#### Drying Packages of Yarn

Société de la Viscose Suisse

BP 740,146

In a machine where several packages are connected to a common supply of hot air the inlet of the duct leading to a package is regulated by a valve controlled by the flow of air into the dust in such a way that with increasing flow the valve is urged to close. This gives greater uniformity of drying of the packages. C.O.C.

#### Webt Straightener

John Dalglis & Sons

BP 738,602

The fabric is overfed, so that there are ripples in it, to mechanism which grips it at both selvages. The alignment of the ripples relative to the direction of the warp is measured photoelectrically. The speed of movement of one selvage relative to the other is controlled in accordance with fluctuations in these photoelectrical measurements so as to keep the ripples at right angles to the warp. C.O.C.

#### Measuring Changes in Length in Material passing through a Machine

Firestone Tyre & Rubber Co.

BP 738,748

A device indicating with great accuracy and reliability the amount of stretch or shrinkage in a moving material. C.O.C.

#### Cover for Jigs

Gustave Glasor Co.

USP 2,698,535

A cover which does not unduly increase the space needed for the jig and which can be opened without either danger to the workmen from escaping steam or condensate dripping upon the fabric. C.O.C.

#### Supporting and Conveying Fabric through a Machine where it is Treated with Jets of Air or Steam

J. Dugler

BP 739,108

#### Control of Tension during Fabric Drying

G. H. Langley

BP 738,983

Method of driving a loop or festoon drying machine so as to ensure natural shrinkage and normal tension of the material. C.O.C.

#### Fixing Cloth on Tenter Pins

Artos Dr.-Ing. Meier-Windhorst

BP 739,931

Friction on the stationary guide member is much reduced and adhesion to the brush increased by feeding compressed air from below against the selvedge of the cloth at the point where it bears against the brush. C.O.C.

#### Raising Machine

Parks & Woolson Machine Corp.

USP 2,698,476

The pile workers rotate as a unit at equal peripheral speeds and similarly connect the counterpile workers as a unit. The fabric is passed in one direction only. The counterpile workers are driven in the same direction as the fabric but at a greater speed while the pile workers have a peripheral speed not greater than the speed of the fabric. This gives very uniform raising. C.O.C.

#### Teasels

J. B. Corson

USP 2,697,265

The life of the teasels can be prolonged several-fold and marked improvement in their performance obtained if their bracts are resiliently interconnected, e.g. by a latex film. C.O.C.

#### Anti-set-off Spraying Apparatus for Use with Printing or other Machinery

R. G. Waller

BP 738,609

Oil Pelleting of Carbon Black (IV p. 34)

Knitwear Printing (IX p. 38)

Magnetic Printing (IX p. 38)

Conditioning Fibrous Materials (X p. 40)

## II—WATER AND EFFLUENTS

### Prevention of Atmospheric and Water Pollution in the Chemical Industry

*Chem. and Ind.*, 1194-1216 (24 Sept. 1955)

#### Water Pollution

B. A. Southgate

*Ibid.*, 1194-1199

### Legal Aspects of Pollution

J. S. Evans

*Ibid.*, 1200-1203

### Discharge of Trade Effluents to Sewage Purification Works

S. H. Jenkins

*Ibid.*, 1204-1207

### Treatment of Strongly Bactericidal Trade Effluent by Activated Charcoal and Biological Means

D. H. Sharp and A. E. Lambdon

*Ibid.*, 1207-1216

### Industrial Waste Guide to the Wool-processing Industry

AATCC Stream Pollution Abatement Committee

*Amer. Dyestuff Rep.*, 44, P 655-P 661 (12 Sept. 1955)

A brief survey of wool textile processes which produce waste effluents and of their polluting effects is followed by a comprehensive account of methods for treating the wastes. There are 58 references. J.W.B.

### Effluents in the Leather Industry

A. Czerny

*Oesterreichische Lederzeitung*, Part B, 39 (1955)

*EPA Technical Digest* No. 68

An account of several methods of dealing with the effluents from tanneries. C.O.C.

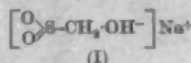
## III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

### Accurate Determination of the Structure of Sodium Hydroxymethanesulphinate (Rongalite)

M. R. Turner

*J.C.S.*, 3064-3072 (Sept. 1955)

Crystal structure analysis, described at length, shows that Rongalite ( $\text{NaHSO}_2 \cdot \text{H-CHO} \cdot 2\text{H}_2\text{O}$ ) is, in the solid state, the dihydrate of sodium hydroxymethanesulphinate (I), and it also yields accurate values of bond lengths in a type of sulphur compound not previously studied. The bond lengths in the anion  $\text{HO-CH}_2\text{-SO}_2^-$  are  $\text{C-O} = 1.409\text{\AA}$ ,  $\text{S-C} = 1.838\text{\AA}$ ,  $\text{S-O} = 1.495\text{\AA}$  and  $1.511\text{\AA}$ , all with standard deviations of 0.01\text{\AA} or less; the bonds to the S atom are arranged pyramidally, the angles being  $\text{O-S-O } 108^\circ 31'$  and  $\text{C-S-O } 101^\circ 25'$  and  $100^\circ 7'$ , while the  $\text{O-C-S}$  angle is  $110^\circ 0'$ . Chemical evidence in favour of this structure is that the parent sulphonylate ion itself is unstable in soln., the only known compounds,  $\text{ZnSO}_2$  and  $\text{CoSO}_2$ , being insol., and that the full reducing power is attained only on warming the formaldehyde-sulphonylate soln.



(I)

H.H.H.

### Fungistatic Capacities of Aromatic Fluorine Compounds in Relation to Cloth-rotting Fungi, Parts 3 and 4

L. R. Tebon

FB 111487-8\*

56 and 48 pp. (Nov. 1952 and Jan. 1954)

Part 3. Tests on 16 aromatic fluorine compounds indicate that presence of 2 F atoms makes a compound more potent than those containing a single F atom, presence in addition of one or more nitro groups markedly increases the fungistatic potency. With nitrobenzene derivatives presence of a Cl or Br atom together with an F atom gives a large increase in effectiveness. The most potent compound tested was 2,4-dinitro-5-fluoro-1-methylbenzene which, however, colours cotton pale yellow.

Part 4. Of a number of compounds tested 4-fluoro-2-chlorophenol was most effective. Introduction of S into the diphenyl linkage appreciably increased the potency of one compound. C.O.C.

\* Obtainable from TIDU at 14/- and 12/- respectively for microfilms.

### Polyvinylpyrrolidone and its Applications

R. J. Holmes and D. B. Witwer

*Amer. Dyestuff Rep.*, 44, P 702-P 704 (26 Sept. 1955)

Polyvinylpyrrolidone (P.V.P.) has potential uses as an adhesive, a stabiliser for polymer emulsions and colloid protector generally, and a film-former. J.W.B.



### Dialysable Derivatives of $\gamma$ -Aminobutyric Acid in Polyvinylpyrrolidone

P. C. Brown and R. Condon

*Chem. and Ind.*, 1452-1453 (5 Nov. 1955)

Polyvinylpyrrolidone appears to contain dialysable substances of low molecular weight, which are transformed by strong acids to  $\gamma$ -aminobutyric acid.  $\alpha$ -Pyrrolidone is suggested as a likely source. It is concluded that, although concentration of proteins by dialysis against polyvinylpyrrolidone is useful for some purposes, it is not a useful method when amino acid or nitrogen analyses are required.

W.R.M.

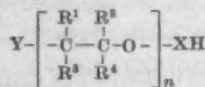
### PATENTS

#### Non-ionic Surface-active Agents

Wyandotte Chemicals Corpn.

BP 739,266

Compounds of formula —



(Y = monovalent, subst. or unsubst. aliphatic and/or aromatic group containing no H atom which can react with an  $\alpha\beta$ -alkylene oxide;  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  = H or aliphatic or aromatic radicals which may contain substituents but neither they nor the substituent must contain an H atom which can react with an  $\alpha\beta$ -alkylene oxide;  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  may be joined together to form carbocyclic rings;  $n$  = < 6-4 when the total C atoms in  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  = 1 and < 3 when the total of C atoms in  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  = < 2; X = polyoxyalkylene chain of  $-(CR^5R^6CR^7R^8O)-$  units;  $R^5$ ,  $R^6$ ,  $R^7$  and  $R^8$  = H,  $CH_2OH$  or



and constitutes 20-95% of the compound) have good surface active properties. They can be made to have any desired balance between hydrophobic and hydrophilic properties.

C.O.C.

#### Emulsifying Agents

Fison's Pest Control

BP 738,667

An oil-soluble emulsifying agent equally suitable for use in soft or hard waters consists of a mixture of a compound of formula  $R^1(OC_2H_5)_2OH$  ( $R^1$  = radical of 10 C), e.g. Emulphor A extra,  $C_{12}H_{25}-p-C_6H_4-(OC_2H_5)_2OH$ , and a Ca, Mg or Zn salt of a sulphosuccinic diester of formula  $CH_2(COOR^2)CH(COOR^3)SO_3H$  ( $R^2$  and  $R^3$  = straight or branched Alk of 6-10 C or cyclohexyl), e.g. Ca salt of a sulphosuccinic acid dioctyl ester.

C.O.C.

#### Starch Products Dispersible and Soluble in Cold Water

Corn Products Refining Co.

BP 739,173

Starch is treated by the following three steps in any order: (a) degrading, by means of acid or enzymic hydrolysis or by oxidation, to a fluidity level within the range 40-90; (b) etherifying, e.g. with an alkylene oxide such as ethylene or propylene oxide, in presence of a starch etherification catalyst to a degree of substitution within the range 0.02-0.1; and (c) completely gelatinising the starch. It is then dried in presence of 3-7% boric acid (on wt. of starch). After grinding and screening, e.g. to between 35 and 120 mesh (U.S.) a product is obtained which is readily and almost entirely dispersible in cold water and which subsequently gives much less water-spotting trouble.

J.W.B.

#### Cold-water-dispersible Starch Products Suitable as Sizes

Corn Products Refining Co.

BP 739,384

Starch is treated with an oxidising agent, e.g. sodium hypochlorite, chromates, dichromates, nitrogen dioxide or sodium *p*-toluenesulphonochloramide, without permitting the reaction to proceed far enough to give extensive breakdown to low-mol.wt. bodies. It is completely gelatinised and dispersed before, during or after oxidation, and dehydrated in presence of 3-7% (on wt. of starch) of boric acid. The product resists water spotting and does not contain sufficient insoluble material to give uneven sizing.

J.W.B.

#### Size having Antistatic Properties

FBy

BP 739,201

Aqueous solutions of the water-soluble products obtained from unsaturated fatty acid amides of low mol. wt. by first polymerising them and then treating with an alkylene oxide, e.g. polyacrylamide treated with 16 mol. of ethylene oxide, are excellent sizes for nylon, cellulose acetate, etc. yarns.

C.O.C.

#### Condensates for Improving the Fastness of Direct Dyeings or Prints

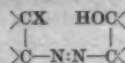
Ciba

BP 738,647

The products obtained by condensing at  $>100^\circ\text{C}$ . a non-cyclic compound containing at least one



group, e.g. dicyandiamide, with an aldehyde and a water-soluble inorganic acid salt of an aliphatic amine containing  $>1$  primary or secondary amino group fully saturated with the acid, and, if desired, again condensing with an aldehyde, are useful for improving the wet fastness of direct dyeings. Used in conjunction with a copper compound they are particularly suitable for treating dyeings or prints made with direct dyes containing a



group (X = OH or COOH, the pair of C atoms to which X is bound are part of the residue of a cyclic diazo component, the pair to which the OH is bound belong to the residue of any desired coupling component).

C.O.C.

#### Urea - Hexamethylenediamine - Formaldehyde Condensates

DuP

BP 739,004

Hexamethylenediamine is slowly added to aqueous formaldehyde at  $<20^\circ\text{C}$ ., preferably at  $0-5^\circ\text{C}$ ., with vigorous agitation. The product is almost pure methylol-hexamethylenediamine. Urea is then added, when a resin forms which is suitable for textile finishes. After the urea is added the mixture, if desired, can be heated to  $80^\circ\text{C}$ . but heating is not necessary to form the resin.

C.O.C.

#### Neutralised Solutions of Alkali Metal Salts of Hydrocarbon-substituted Silane Triols—Water-repellent Agents

General Electric Co.

BP 738,693

Aqueous solutions of hydrocarbon-substituted silane triols are readily neutralised down to pH 6.8-7.0 with an aluminium salt without affecting their stability. The neutralised solutions are effective water-repellent agents for application to textiles, paper, etc.

C.O.C.

#### Moth- and Rot-proofing Agents

FBy

BP 738,758

Compounds of formula  $[Hal_xR^1SO_2NH]_xR^2$  ( $R^1$  = aliphatic hydrocarbon radical;  $x$  = whole number;  $n$  = 1 or 2 depending upon the valency of  $R^2$ ;  $R^2$  = mono- or divalent polynuclear carboxylic radical in which the aromatic nuclei are linked either by C-C, O, S,  $SO_2$ ,  $SO$ ,  $CH_2$ ,  $CH=CH$ , CO, N=N or they are condensed) give excellent protection to textiles against textile pests, e.g. they not only mothproof wool but give it protection against termites, protect rayon against silverfish and Algerian fibre against mites. They have also excellent rotproofing properties. On animal fibres they are resistant to washing and milling. Thus wool is treated with an aqueous solution of the tetrachloro-(4-phenyl)-anilide of chloromethane sulphonic acid, or with a solution in dry-cleaning spirit of the [2-(2'-chlorophenoxy)-3:5-dichloro]-anilide of chloromethane sulphonic acid, or in a soap solution containing  $NN'$ -bis-(chloromethanesulphonyl)-tetrachlorobenzidine, in a neutral or acid dyebath with the triethanolamine salt of the tetrachloro-(4-phenyl)-anilide of chloromethane sulphonic acid. Furs are treated by drumming them with sawdust impregnated with an organic solvent solution of the tetrachloro-4-phenyl-anilide of chloromethane sulphonic acid.

C.O.C.



**Vinyl Fluorinated Alkyl Ethers and their Polymers**

Minnesota Mining & Manufacturing Co. BP 739,731  
Compounds of formula  $C_nF_{2n+1}-CH_2-O-CH_2-CH_2$  ( $n = 3-11$ ), e.g. vinyl 1:1-dihydroperfluorobutyl ether  $CF_3-(CF_2)_2-CH_2-O-CH_2-CH_2$ , are clear colourless water-insoluble liquids, soluble in common organic solvents. Those containing 6-8 C are readily polymerised to rubbery polymers containing >58% by wt. of combined fluorine. These polymers are flame-resistant, hydrophobic and oleophobic. They are used in flame-resistant coatings. Those containing >8 C readily polymerise to waxy products useful for waterproof, flameproof and oilproof textiles and paper. C.O.C.

**Coating and Sizing Composition**

Dow Chemical Co.

USP 2,697,666

An aqueous methyl cellulose composition plasticized with *N*-acetylaniline is an excellent size for cellulose acetate, nylon, acrylonitrile and polyvinyl chloride fibres and the like. C.O.C.

**Solutions of Acrylonitrile Polymers**

BrC

BP 738,759

The polymer is dissolved in a concentrated solution of a salt (which yields in aqueous solution at least one strongly hydrated ion, e.g. a thiocyanate, perchlorate, nitrate, chloride, bromide or iodide of Li, Na, K, Ca, Zn, Cd or Al) in a mixture of water and <20% by weight of an alcohol at 20-40°C. C.O.C.

**Non-laddering Composition**

Evans Chemicals

BP 736,973

A high-viscosity polyvinyl alcohol dissolved in a mixture of water, alcohol and ether and applied to a damage in a stocking prevents further laddering before repair. G.E.K.

**IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS****Steric Effects in Dyes**

W. R. Brode

Roger Adams Symposium, Univ. Illinois

3-4 Sept. 1954, 8-59

Chem. Abs., 49, 12837 (25 Sept. 1955)

A discussion from the physicochemical and electronic viewpoints of steric effects in dyes. It deals with: colour measurement by absorption spectra techniques; definition of terms, bathochromic, hypsochromic, hyperchromic, and hypochromic effects; chromophores; absorption band properties; consideration of isomeric and steric effects on colour; investigation of position, geometrical, and optical isomerism; effect of steric hindrance on tinctorial strength and hue; effect of substituents on auxochromic groups in the azo series; steric inhibition in the diphenyl series; steric effects in monoazo and diazo dyes; structure of Indigo, Pechmann dyes, Genacryl and Quinaldine Reds; absorption process and steric properties; theory of dyeing; optically active dyes. 54 references. C.O.C.

**Mechanism of the Oxidative Coupling of *p*-Aminodimethylaniline with Phenols**

S. Hünig and W. Daum

Annalen, 595, 131-159 (Oct. 1955)

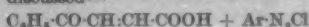
The reacting species may be either the amine itself (I), the cationic free radical (Wurster's Red; II), or the doubly charged cation of the quinone-dimine (III). All three react in about 100% yield with excess of 2-chloro-1-naphthol and ferriyanide at pH 5-7, but the velocity of reaction increases in the order I < II < III. From experiments using phenol and 5-chloro-2-hydroxytoluene it is concluded that in weakly acid soln. the reaction proceeds via II not III, but III can react when added in substance. III is hydrolysed to the quinone-monoimine in alkaline soln. By employing 4-bromo- and 4-hydroxy-methyl-2:6-di-*tert*-butylphenol, coupling to undissociated phenol is shown to occur. Coupling activity of the 5-halogeno-2-hydroxytoluenes decreases in the order  $F > Cl > Br > I$ , indicating that a mesomeric phenoxy radical is formed as a first step, which is confirmed by expt. using 2:4:6-trialkylphenols in which the *p*-alkyl group is displaced. Less likely, alternative mechanisms could apply. H.E.N.

**Condensation of Aryldiazonium Salts with Reactive Unsaturated Compounds. VII—Action of Aryldiazonium Chlorides with  $\beta$ -Benzoylacrylic Acid**

H. S. Mehra and K. B. L. Mathur

J. Indian Chem. Soc., 32, 465-470 (July 1955)

*cis*- and *trans*-Benzoylacrylic acids with diazotized 2-, 3-, and 4-chloroaniline, 2-, 3-, and 4-nitroaniline, and 4-bromoaniline give the corresponding chalcones (I) in 4-27% yields. They can be extracted from the reaction mixture with boiling aqueous potassium bisulphite or 80-85% sulphuric acid. The mechanism of the reaction is discussed—



(I)

C.H.R.

**Determination of Arrhenius Parameters for a Normal-to-iso-diazoate Transformation**

R. J. W. Le Fèvre and J. B. Sousa

J.C.S., 3154-3158 (Sept. 1955)

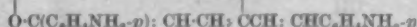
The change of the normal sodium diazoate from sulphonic acid into its *iso* isomer in aq. NaOH, when examined kinetically, indicates a frequency factor of  $10^{12}-10^{14}$  sec.<sup>-1</sup> and an energy of activation of 25-27 kcal./mole. The conversion is 97-100% in 0.5-4.85 *N*-NaOH soln. H.H.H.

**Furylazo Dyes**

G. Modena

Ricerca sci., 25, 589-591 (1955)

Chem. Abs., 49, 12833 (25 Sept. 1955)



was tetrazotised and coupled to give with *o*-HOC<sub>6</sub>H<sub>4</sub>COOH an orange dye; Schäffer acid, violet; N & W acid, blue-violet; H acid, blue-green; chromotropic acid, blue;  $\gamma$ -acid, blue-violet; J acid, purple; uric acid, purple. The fastness of their dyeings compared well with those of the azobenzene analogues. C.O.C.

**Synthesis of Pyrazolone Dyes**

H. Yasuda

Rept. Sci. Research Inst. (Japan), 30, 340-9 (1954)

Chem. Abs., 49, 12836 (25 Sept. 1955)

Fourteen 1-aryl-4-aryloxy-3-carbethoxy-5-pyrazolone dyes, ten of which had not been previously mentioned in the literature, were obtained by treating diethyl acetyl-succinate with aromatic diazonium chlorides. They were yellow-orange-yellowish brown, the  $\lambda_{max}$  shifting towards the shorter wavelengths with increase of Hammett's constant of substituted radicals. C.O.C.

**Acylation and Allied Reactions catalysed by Strong Acids. XIV—Some Reactions of the  $\alpha$ -Chlorodiphenylmethyl ( $^+C(C_6H_5)_2Cl$ ) and *p*-Methoxytriphenylmethyl Cations**

H. Burton and G. W. H. Cheeseman

J.C.S., 3089-3092 (Sept. 1955)

Diphenylmethylenedichloride (benzophenone chloride) reacts with silver perchlorate or, more conveniently, aluminium chloride to give products showing the reactions of the  $\alpha$ -chlorodiphenylmethyl cation  $^+C(C_6H_5)_2Cl$ . Various reactions of the *p*-methoxytriphenylmethyl cation are also studied. The rearrangement of *p*-methoxytriphenylmethyl phenyl ether by HCl affords 4-hydroxy-4'-methoxytetraphenylmethane. H.H.H.

**Production of Carbonium Ions by the Action of Metal Salts. II—Extinction Coefficient of Carbonium Ions**

J. W. Bayles, J. L. Cotter, and A. G. Evans

J.C.S., 3104-3105 (Sept. 1955)

The assumption in Part I (J.C.S., 296 (Jan. 1955)), that the extinction coefficient of triphenylmethyl ions in nitromethane solutions of HgCl<sub>2</sub> (whether as an ion pair  $(C_6H_5)_3C^+HgCl_2^-$  or as free ions  $(C_6H_5)_3C^+ + HgCl_2^-$ ) was the same in conc. H<sub>2</sub>SO<sub>4</sub>, is now verified. The addition of HgCl<sub>2</sub> to a nitromethane soln. of triphenylmethyl chloride very markedly increases the ionisation of the organic chloride, and, in the case of HgBr<sub>2</sub>, the ionisation can attain 100%. H.H.H.

### Interaction between Electrons in One-dimensional Free-electron Model with Application to Absorption Spectra of Cyanine Dyes

G. Araki and F. Araki

*Progr. Theoret. Phys. (Japan)*, 11, 20-4 (1954)*Chem. Abs.*, 49, 12949 (10 Oct. 1955)

The interaction between electrons in a deep square-well potential field is discussed as a one-dimensional case. The potential of one-dimensional 2-electron force is assumed to be a transversal average of the 3-dimensional Coulomb potential. The calculated excitation energy is compared with the experimental data for absorption maxima of cyanine dyes. C.O.C.

### Polynuclear Cyanine Dyes

H. Zenno

*Japan. J. Pharm. & Chem.*, 27, 286-323 (1955)*Chem. Abs.*, 49, 12442 (25 Sept. 1955)

Review, 79 references.

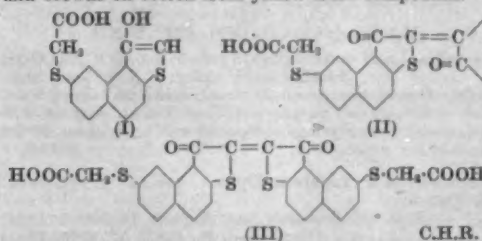
C.O.C.

### Indigoid Dyes. XV—Thioindigoid Dyes derived from Naphthalene-2:7-disulphonic Acid

P. C. Dutta and D. Mandal

*J. Indian Chem. Soc.*, 32, 423-426 (July 1955)

The thioindoxyl-thioglycollic acid compound (I), prepared by treating 2:7-dimercaptanaphthalene with chloroacetic acid and cyclising the dithioglycollic acid thus formed, gives with o-diketones, such as bromo- and nitro-isatins, acenaphthoquinone and its nitro derivatives, phenanthraquinone, and acenanthraquinone, the corresponding indigothioglycollic acid (II), and on oxidation with alkaline potassium ferricyanide the bisindigothioglycollic acid (III). These dyes give reds to blues and browns on cotton from yellow leuco compounds.



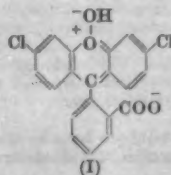
C.H.R.

### Phototropy of New Photosensitive Complexes between a Fluorescent Pigment and Mercapto Compounds (Thiols)

E. Fujimori

*Bull. Chem. Soc. Japan*, 28, 334-339 (July 1955)

The fluorescent pigment I forms complexes with egg albumin, glutathione, cysteine, and thioglycollic acid by virtue of their thiol groups. In each case there is a marked decrease in fluorescence and a shift of absorption maximum to longer wavelengths. All complexes are bleached by white light, the colour being subsequently regenerated in darkness by a thermal reaction. The degree of regeneration is low with protein complexes but almost 100% with those of cysteine and thioglycollic acid. It is assumed that pigment radicals and thiol radicals are produced on illumination.



(I)

A.J.

### Constitution and Synthesis of Leucoanthocyanidins

F. E. King and J. W. Clark-Lewis

*J.C.S.*, 3384-3388 (Oct. 1955)

### Similarities between So-called Chlorophyll b'' and Oxidised Chlorophyll b, and between So-called Chlorophyll a'' and Oxidised Chlorophyll a

H. H. Strain

*J. Amer. Chem. Soc.*, 77, 5195-6 (5 Oct. 1955)

Heat, alkalis and oxygen convert chlorophylls a and b into several chromatographically distinct pigments spectrally similar to the parent chlorophylls. Of these

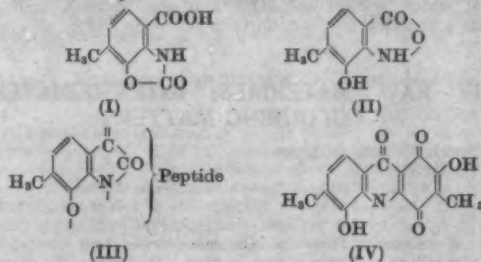
pigments chlorophylls a' and b' are isomers or other reconvertible alteration products of the common chlorophylls. Others are oxidation or allomerisation products that are not reconvertible to the chlorophylls. Yet others, chlorophylls a'' and b'', have hitherto been regarded as chlorophyll isomers although they also resemble the non-reconvertible allomerised chlorophylls. Evidence is now given which indicates that chlorophylls a'' and b'' are really oxidised chlorophylls and not isomeric chlorophylls. C.O.C.

### Chromophore of Actinomycin

S. J. Angyal, E. Bullock, W. G. Hanger, and A. W. Johnson

*Chem. and Ind.*, 1295-1296 (8 Oct. 1955)

The chromophore of the actinomycin group of antibiotics shows many properties of a hydroxyquinone, but differs in its behaviour to cold dil. NaOH, giving a colour change from yellow to almost colourless instead of the usual bathochromic shift. This change is not due to ionisation but is probably caused by a reaction between actinomycin and hydroxyl ions (kinetic measurements) and is similar to the conversion of isatin to a salt of isatinic acid in similar circumstances. Treatment of actinomycin with alkaline  $H_2O_2$ , followed by acid hydrolysis of the peptide chain, yields 7-methylbenzoxazolen-4-carboxylic acid (I). The formation of I from 6-methyl-7-hydroxyisatin (II) by means of alkaline  $H_2O_2$  confirms the presence of this residue in actinomycin (III). A comparison of the properties of actinomycinol (obtained from III by means of baryta) with those of 3-hydroxy-2-methoxy-10-methacridone-1:4-quinone and its 2-hydroxy-3-methoxy isomer allows actinomycinol to be formulated as IV.



(III)

(IV)

A.J.

### Chemistry of the Coprosma Genus. X—Colouring Matters from Coprosma rhamnoides

L. H. Briggs and A. R. Taylor

*J.C.S.*, 3298-3299 (Sept. 1955)

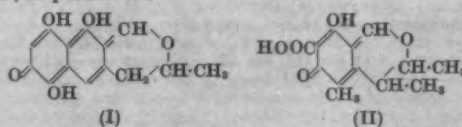
Concentration of aq. extracts of the bright yellow root bark afforded rutin; chromatography of an acetone extract on magnesia gave a series of coloured bands from which rutin, anthragallol 1:2-dimethyl ether, and rubiadin 1-methyl ether were isolated; and complete chromatography, based on a 1:1 mixture of  $MgCO_3$  and diatomaceous earth, yielded only rubiadin 1-methyl ether. H.H.H.

### Studies in Mycological Chemistry. IV—Purpurogenone, a Metabolic Product of Penicillium purpurogenum Stoll

J. C. Roberts and C. W. H. Warren

*J.C.S.*, 2992-2998 (Sept. 1955)

Isolation of the dark red pigment, purpurogenone, is described, its mol. formula established as  $C_{14}H_{10}O_5$ , and the constitution of dihydroxychromanobenzoquinone (I) suggested. Resemblance to the yellow pigment citrinin (II) is pointed out.



(I)

(II)

H.H.H.

### Pigments from Isomers of C Acid

E. Koike, S. Suzuki, H. Iida, I. Tanakadate, and S. Aiso

*J. Chem. Soc. Japan, Ind. Chem. Sect.*, 58, 62-6 (1955)*Chem. Abs.*, 49, 12853 (25 Sept. 1955)

19 Pigments have been made by coupling nine isomers of chlorotoluidine sulphonic acid with  $\beta$ -naphthol and/or

2:3-hydroxynaphthoic acid. The hue and fastness to moisture, chemicals, solvents and light are tabulated. Most promise was shown by pigments having a benzene nucleus containing an  $\text{SO}_3\text{H}$  radical *o* to  $\text{NH}_2$  and Cl in *p* position to  $\text{SO}_3\text{H}$ . C.O.C.

#### Typophor Black FB

H. Ikegami, T. Izume, and H. Hiyama

*Science & Industry (Japan)*, **27**, 59-61 (1953)

*Chem. Abs.*, **49**, 12836 (25 Sept. 1955)

4-Phenylazo-1-naphthylamine hydrochloride coupled with 2:2-dimethyl-2:3-dihydro-1-benzo[de]quinazoline yielded a pigment with a purplish black metallic lustre. Replacing the quinazoline by 1:8-diaminonaphthalene sulphate gave a pigment having the same colour. A mixture of the two pigments (2:1) yielded a dye identical with Typophor Black FB. C.O.C.

#### Silking of Chromes

V. G. Joshi

*Paints India*, **2**, (1), 124 (1952)

*Natl. Paint, Varnish Lacquer Assoc., Sci. Sect.*

*Spec. Circ., Abstr. Rev. No.* 190, 102 (1953)

*Chem. Abs.*, **49**, 12853 (25 Sept. 1955)

Silking is noticed in nitrate lemon chromes, acetate chromes prepared with sulphuric acid, and chrome-greens where the blue is oxidised by hydrochloric acid and dichromate. Apparently washing is important, silking being caused by mineral acid. It can be avoided by preparing the chromes from mixtures of lead nitrate and lead acetate, maintaining the ppt. with acetic acid, incorporating aluminium hydroxide, incorporating enough  $\text{PbSO}_4$  in primrose chromes and white lead in lemon chromes, and maintaining the ppt. with acetic acid in the final washing. Lemon chrome precipitated in a small quantity of glass white yields soft yellows and greens. C.O.C.

#### Iron Oxide Pigment having Low Oil Absorption

M. Klang

*Rev. chim. (Bucharest)*, **5**, 45-50 (1954)

*Chem. Abs.*, **49**, 13663 (10 Oct. 1955)

When preparing  $\text{Fe}_2\text{O}_3$  electrolytically using brine as the electrolyte and iron plates as electrodes, power consumption was least when the electrodes were not far apart, the strength of the brine high, the temperature  $60^\circ\text{C}$ ., and the current densities low. The  $\text{Fe}(\text{OH})_3$  produced was thoroughly washed, calcined at  $600^\circ\text{C}$ . for 2 hr., and ball-milled. The product was light red and had oil absorption index of 24-26 (amount of oil needed to produce a stiff, putty-like paste with 100 g. pigment). C.O.C.

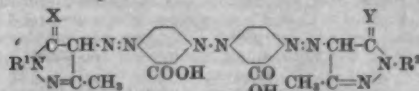
#### PATENTS

#### Direct Cotton Trisazo Dyes for After-coppering

ICI

BP 738,999

Trisazo compounds—



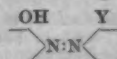
( $\text{R}^1$  and  $\text{R}^2$  = benzene or naphthalene series radicals which may carry substituents other than  $\text{SO}_3\text{H}$  or  $\text{COOH}$ ; X and Y = O or NH), prepared by coupling tetrazotised 4:4'-diaminobenzene-3:3'-dicarboxylic acid (I) with suitable pyrazolones or aminopyrazoles, are orange to violet after-copperable direct cotton dyes, which when faded by exposure to light maintain their original hue and merely lose intensity. Thus I tetrazotised and coupled with 2 mol. of 1-m-aminophenyl-3-methyl-5-pyrazolone gives a yellow-red. E.S.

#### Metallisable Dis- and Poly-azo Direct Cotton Dyes

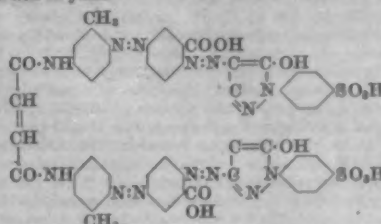
B.

BP 738,598

Metallisable dis- and poly-azo direct cotton dyes are prepared by condensing 2 mol. of suitable aminoazo compounds with 1 mol. of a dicarboxylic dihalide  $\text{X}\cdot\text{CO}\cdot\text{CR}\cdot\text{CH}\cdot\text{CO}\cdot\text{X}$  ( $\text{R} = \text{H}, \text{CH}_3, \text{Cl}$ , or  $\text{Br}$ ) in presence of an acid-binding agent. The aminoazo compounds are chosen so that at least one metallisable grouping—



( $\text{Y} = \text{OH}, \text{COOH}, \text{OCH}_3$ , or  $\text{OCH}_3\cdot\text{COOH}$ ) may be present, and the dye mol. contains groups conferring water-solubility, and  $<7$  azo groups. Mixtures of 3-aminoazo compounds, not necessarily in equimolecular proportions, may be used; the mixtures of dyes obtained in this way sometimes have desirable properties. Metallisation may be carried out with Cu or Ni compounds in substance, or on the fibre. Thus the nitro group of the monoazo dye 5-nitroanthranilic acid  $\rightarrow$  3-methyl-1-p-sulphophenyl-5-pyrazolone is reduced, and the aminoazo compound so formed is diazotised and coupled with *m*-toluidine. The aminodiazazo compound so formed is condensed with fumaryl dichloride at the ordinary temperature in presence of soda ash to yield—



which dyes cellulosic fibres red-orange by the after-coppering process. E.S.

#### N-Hydroxyalkylsulphamylanilino - dihydroxy - nitroanthraquinones—Disperse Dyes

General Aniline

BP 737,986

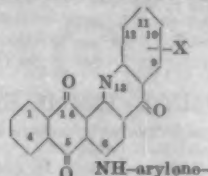
One of the  $\text{NO}_2$  groups in 4:8-dinitroanthraquinone or in 4:5-dinitrochrysanin is replaced with an anilino group containing a *N*-hydroxyalkyl- or *N,N*-bis(hydroxyalkyl)-sulphamyl group to give blue disperse dyes fast to light and gas fumes on cellulose acetate, and suitable for dyeing polyester fibres. Thus 4:8-dinitroanthraquinone is heated at  $165\text{--}170^\circ\text{C}$ . for 7 hr. with *N,N*-bis(2-hydroxyethyl)-metanilamide in nitrobenzene. R.K.F.

#### Phthaloylacridones—Vat Dyes

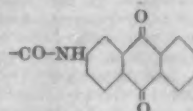
ICI

BP 737,586

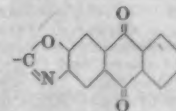
Phthaloyl-acridone derivatives of formula—



( $\text{X} = \text{COR}, \text{SO}_2\text{R}, \text{CF}_3, \text{CN}$  or  $\text{CONR}_2$ , where  $\text{R} = \text{Alk}$  or  $\text{Ar}$ ; and  $\text{Y} =$



or



are green vat dyes which are brighter than the corresponding compounds unsubstituted in the 9, 10, 11 or 12 position. They are made, e.g. by refluxing 6-amino-11-benzoyl-3':4'-phthaloylacridone (condensation, e.g. of 4-benzoylanthranilic acid with 1-amino-4-bromoanthraquinone-2-sulphonic acid, followed by cyclising and desulphonating) with 2-p-bromophenyl-5':6'-phthaloylbisoxazole in nitrobenzene in presence of  $\text{Na}_2\text{CO}_3$  and  $\text{Cu}_2\text{Cl}_2$ . R.K.F.

#### Phthalocyanine Formers

Gy

BP 737,413

Compounds, which, incorporated into printing pastes with alkylamines, Cu or Ni salts, ammonia and the usual



thickeners produce phthalocyanine derivatives when printed on e.g. cotton, are made by adding a halogen hydrazide to a phthalonitrile and then transforming the product into the halogen hydrazide salt of a basic compound by treating with ammonia or ammonia-liberating substances. Thus phthalonitrile is stirred with HBr in glacial acetic acid at 35–40°C. The resulting white product after filtering off and vacuum drying is treated with conc. aq.  $\text{NH}_3$ . R.K.F.

#### Phthalocyanine Pigments Tinctorially Stable in Aromatic Solvents

American Cyanamid Co.

USP 2,699,440

USP 2,699,442-4

Metal phthalocyanines are obtained in the  $\beta$ -form by forming them into a slurry in an autoclave with a saturated alicyclic hydrocarbon solvent and acid pasting it in presence of a stabiliser. The slurry is then heated until it becomes thick and viscous after which the pigment is filtered off and washed. Thus, copper phthalocyanine (230 parts) (prepared by the process of USP 2,318,783 but using decalin instead of nitrobenzene) is acid-pasted and slurried in xylene (1400), and water (10). Octadecylisocyanate (10) is added. The sodium salt of disulphodiphenylmethane (10) is dissolved in water (1000) and added to the slurry. The xylene is then steam distilled off and the pigment filtered off, washed and dried at 50°C. The finished pigment is tinctorially stable even when treated with toluene at 54°C. for 8,000 hr. C.O.C.

#### Oil Pelletting of Carbon Black

Phillips Petroleum Co.

USP 2,699,381

#### Calcium Phosphate Phosphors

Sylvania Electric Products

BP 738,733

Phosphors responding to excitation by ultraviolet radiation contain a total of 2.90–2.98 g. atoms of Ca, Mn and Sn for each 2.00 g. mol. of  $\text{PO}_4$  radical. The fluorescence can be varied from pale blue green through pale yellow and orange to deep red by varying the Mn content. C.O.C.

#### Unit Processes in Chemical Engineering—Annual Review (I p. 28)

Condensates for Improving the Fastness of Direct Dyes or Prints (III p. 30)

Imitation Pearl (V this page)

Dyeing and Printing Cellulose Fibres with Metallisable and Metal-complex Disazo Dyes (VIII p. 37)

### V—PAINTS; ENAMELS; INKS

#### Pigmentation of Polyvinyl Acetate Emulsion Paints

A. C. Fletcher and P. J. Wilson

J. Oil & Col. Chem. Assoc., 38, 544–549 (Sept. 1955)

Ancillary agents are used in the preparation of the pigment pastes, with which the plasticised polyvinyl acetate (P.V.A.) emulsion is compounded, and these include wetting agents, dispersing agents, and viscosity stabilisers. The most efficient systems contain a balance of anionic and non-ionic agents; cationic agents may cause instability in the compounded paint. The following combinations are very effective—(1) methylcellulose with Na polymetaphosphate, or Na tetrapyrophosphate, or low-mol.wt. polymethacrylates or polyacrylates; (2) Na carboxymethylcellulose with polyalkylene oxide ethers, or polyalkylene fatty acid esters; (3) Na polymethacrylate with sodium polymetaphosphate, with a non-ionic wetting agent. Pigments, extenders, and fillers that are hydrophilic require only dispersing and viscosity-stabilising agents; those that are hydrophobic require also a wetting agent during milling. Certain materials such as rutile  $\text{TiO}_2$ , absorb ionic agents, and will ppt. ionically stabilised emulsions, unless these contain sufficient stabiliser to allow for the uptake. The concentration of ancillary agents should be such that the critical pigment-volume concentration of the pigment phase is at a max. Illustrative results are quoted. Certain coated rutile  $\text{TiO}_2$  pigments (and whiting also), when ground in the presence of ammonium salts of polyelectrolytes, form “seedy” pastes; this is obviated if a non-ionic wetting agent is used, together with a polyphosphate dispersing agent (which forms an adsorbed protective layer on the pigment). A formulation is given for a simple white pigment paste suitable for use with most P.V.A. emulsions. The choice of tinting

pigments is briefly discussed, and suitable materials are listed. All components of pigment mixtures must be well dispersed, or differential pigment flotation may occur. Some suggestions are made for overcoming difficulties in the formulation of pastel and deep-shade paints. The manufacture of the pigment paste, and of the emulsion paint, is outlined. J.W.D.

#### Flocculation of Phthalocyanine Blue

E. G. Shur

Paint & Varnish Production, 45, (5) 30–3, (6) 30–9, 70 (1955)

Chem. Abs., 49, 13663 (10 Oct. 1955)

Flocculation effects got by dispersing a crystallisation-resistant Cu phthalocyanine blue in mineral oil and raw castor oil with various solvents and in solvents alone are described. The rate and extent of flocculation were determined by sedimentation volume and rate studies and definite correlation was found between this method and photomicrographic methods. In oil and solvent systems the acetates gave greater resistance to flocculation in this order, ammonium < butyl < ethyl acetate. Toluene usually is better than benzene for minimising flocculation, and both are better than aliphatic hydrocarbons. Of the higher polarity solvents tested only butyl alcohol outstandingly repressed flocculation. Probably a balance of polar and nonpolar characteristic is advantageous for vehicles and solvents used for dispersing phthalocyanine blues. C.O.C.

#### Inks and Processes for Printing on Tinplate, Aluminium, Brass, etc.

Rassegna grafica (Italy) (24, supplement) 28–32

(12–27 April 1954)

EPA Technical Digest No. 45

#### How to Prepare and Apply Colours in Porcelain Enamelling

W. G. Coulter

Ceramic Industry (U.S.), 92 (Nov. 1954)

EPA Technical Digest No. 76

The porcelain enamels most widely used are (1) clear enamels, (2) antimony-opacified enamels, (3) zirconium-opacified enamels, and (4) titanium-opacified enamels. Clear enamels are used in the sign industry and usually contain 2–3% oxide and no opacifier. Titanium enamels have largely replaced the antimony and zirconium varieties in the appliance and sanitary ware industry, except in dry process enamelling. Originally used only for white, coloured titanium enamels are being increasingly used. Enamel frits are essentially high alkali borosilicates with such substances as alumina, fluorine and calcium usually included together with a Ti, Zr or Sb opacifier. Ti-opacifier frits cause more colour problems than Sb frits because of the coloured titanates that may be formed during firing. Yellows are obtained by using Cd-Se or Pb-Sb stains and browns by use of Cr-Fe-Zn colours. Cd-Se, Cr-Sn, Cr-Ti and gold-maroon stains are used for reds, maroons and purples. Co stains are satisfactory blues for Zr and Sb enamels but are not too stable in Ti enamels because of formation of Co titanate. For the same reason chrome greens are difficult to stabilise in Ti enamels but work well in Zr or Sb frits. Coloured enamels are largely applied to sheet steel by screen printing, the paste being made up of the frit, metallic oxides and oil. Alumina enamels are coloured with the same stains used for the Sb, Zr or Ti enamels and give better colour stability. C.O.C.

#### Imitation Pearl

##### III—Pearl Essence

J. Kishi

Repts. Ind. Research Inst., Osaka Pref., 7, (1), 43–5

(1955)

Kawako fish scale is washed with ethanol to yield a product containing 68.7% guanidino. A lacquer for coating glass beads to make artificial pearls consists of the above product (20 g.), 90:350 cellulose nitrate-butyl acetate (60), acetone (8) and ethylacetate (10).

#### IV—Pearly Substance Prepared from 9-Phenyluric Acid

Ibid., 46–47

Chem. Abs., 49, 13553 (10 Oct. 1955)

9-Phenyluric acid (7.5 g.) in boiling water (200 ml.) is poured into methyl alcohol (500 ml.) at –10°C., kept a



while at 6°C., the precipitate filtered off, washed with methyl alcohol and then mixed with 90:850 cellulose nitrate-butyl alcohol (10 g.) to yield a pearl paste.

C.O.C.

#### Pigment Dispersion. V—Behaviour of Toluene Red

R. L. Whitney, et al.

Offic. Digest Federation Paint & Varnish Production Clubs, 26, 1093-1107 (1954)

## PATENTS

#### Texture Paint

Reardon Co.

USP 2,699,401

A texture paint (a paint which gives a stippled or wavy coating) which can be prepared as a powder to be mixed with water immediately before use contains a bodying material, e.g. mica, asbestos or gypsum, pigment, filler and as binder, starch and a water-soluble cellulose ether.

C.O.C.

#### Heat-stable Colour Coatings

BASF

BP 739,569

Heat-stable colour coatings of good adhesive properties can be prepared by using as binding agent a glass in which the silicic acid has been wholly or partly replaced by aluminium phosphate in which the molecular ratio of  $Al_2O_3:F_2O_3$  is from 2:1 to 1:1.5. The glass is finely ground, mixed with an inorganic pigment and then pasted with either water or a lacquer. After this paste has been applied to the article to be coated, it is baked at a temperature above the softening point of the glass.

C.O.C.

## VI—FIBRES; YARNS; FABRICS

### Fibres

C. S. Grove, R. S. Casey, and J. L. Vodonik

Ind. Eng. Chem., 47, 1973-1981 (Sept. 1955, Part II)

Annual review of textile developments covering 1954, under the headings—production, market forecasts, industrial uses, rubber-coated textiles, synthetic fibres, cotton fibre treatments, ramie and asbestos, blends, and finishes.

W.K.R.

### Plasticity of Wool

P. L. le Roux and J. B. Speakman

Nature, 176, 510 (10 Sept. 1955)

A comparison of plasticity and tyrosine content of a number of fibres from single staples of two New Zealand Romney wools establishes a relationship between the two. Fibres showing the highest plasticity (long heterotrichs from secondary follicles) have a significantly higher tyrosine content than those of lower plasticity (early curly-tips from primary follicles).

A.J.

### Protective Action of Wool Wax and Suint against the Photolysis of Wool

E. V. Truter and F. P. Woodford

J. Textile Inst., 46, T 641-T 652 (Oct. 1955)

Raw, solvent-purified, and deliberately waxed and/or suint-coated wool is exposed to radiation from both a Fade-Ometer and a Hanovia S 500 mercury-vapour lamp; single wool fibres are also treated. Solubility in alkali is used as a criterion of damage for the bulk material, and work to stretch for the single fibres. It is shown that wool wax confers no protection against irradiation unless the layer is of sufficient thickness to exclude moisture and air, but that the suint has a marked protective effect. No explanation is offered; it is pointed out that the effect may be of no importance, since only primary fibres (i.e. only 4% of the total in merino) are supplied with suint direct from the glands. Some of the estimations of alkali solubility are carried out by ultraviolet absorption measurements on the alkaline extract and are in good agreement with the loss in weight obtained by the conventional method. It is thus possible that the radiation-absorption technique will prove of value, as it is very much quicker than conventional drying and weighing.

J.W.B.

### Day-to-day Problems in the Hatting Industry

A. Baines and D. Haigh

J. Textile Inst., 46, T 630-T 648 (Sept. 1955)

A survey, illustrated by flow diagrams, is presented of the processes in the hatting industry. It includes discussions of problems connected with damage assessment, the presence of chlorinated wool in blends, carbonising damage, dyeing, proofing against microorganisms, and blending with regenerated protein fibres.

J.W.B.

### Some Uses of Synthetic Fibres in Felt Manufacture

Anon.

Bull. Inst. Tech. France, (55), 65-74 (Aug. 1955)

A review of previous work. For wool-synthetic fibre blends processed by classical methods, only those synthetic fibres possessing marked plasticity have given encouraging results. Newer methods for producing felts from blends not containing wool rely on the action of adhesives or on the deformation by heat of thermoplastic fibres. 13 references.

J.C.F.

### Multiple Necking Effect in Nylon

H. J. Woods

J. Textile Inst., 46, T 629-T 630

T 631 (Sept. 1955)

When undrawn nylon monofilaments (diameter approx. 150  $\mu$ ) are cold-drawn while immersed in any one of several solvents a number of transverse cracks appear at isolated places on the surface, usually encircling the whole fibre. As drawing proceeds they deepen, and a neck appears which gets wider and deeper until at this position the fibre attains its drawn diameter. Further cracks form meanwhile and develop into necks, but a stage is reached at which the fibre is like a rod with a series of discs, of different thicknesses, strung along its length. When drawing is complete traces of the irregularities are seen as surface markings. The effect is observed when nylon is immersed for a minute and then drawn in benzene, acetone, amyl acetate, nitrobenzene, ethylene dichloride,  $CHCl_3$ , and xylene, but not in air, water,  $CCl_4$ , light petroleum, absolute alcohol, or liquid paraffin. A less striking effect is shown after a few days' immersion in acetone, and a modified effect in glycerol, when short transverse cracks but no necking occur, and a very rough surface is ultimately obtained.

In a comment, D. C. Hookway remarks that the phenomenon has been noticed, and he considers it to be due to a reduction in plasticisation. If fibre and liquid are humidified at 65% R.H. for 24 hr. the effect is not found, and dry alcohol and dry  $CHCl_3$  may have sufficient swelling action to prevent it.

J.W.B.

### Mechanism and Kinetics of $\epsilon$ -Caprolactam Polymerisation in presence of Water

V—Kinetic Measurements on the Formation of Poly- $\epsilon$ -caprolactam in Neutral Medium

F. Wiloth

Kolloid-Z., 143, 129-139 (Oct. 1955)

The kinetic course of the thermal  $\epsilon$ -caprolactam polymerisation from  $\epsilon$ -caprolactam is investigated at 220°C. in the presence of varying amounts of  $H_2O$  and of  $\epsilon$ -aminocaproic acid. The polymerisation reaction ends in an equilibrium.

### VI—Measurement of Electrical Conductivity during the Polymerisation of $\epsilon$ -Caprolactam in Neutral Medium

F. Wiloth and W. Dietrich

Ibid., 143, 138-144 (Oct. 1955)

It is shown that, by measurement of the electrical conductivity of polymerising caprolactam melts, the course of the chain formation can be directly followed. The rates of the polymerisation in presence of water and of  $\epsilon$ -aminocaproic acid are given, and the influence of the heating period, initial homogeneity of the melts, and temp. is recorded. Certain fluctuations in the chemical analytical data are now explained.

H.H.H.

### Condensation Polymers and Dithioglycolide by Dehydration of Thioglycolic Acid

A. Schöberl and G. Wiehler

Annalen, 595, 101-130 (Oct. 1955)

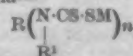
## PATENTS

### Viscose Filaments with Thicker Skins

Courtaulds

BP 739,072

Filaments, etc., are produced by extruding viscose containing < 0.1 millimole per 100 g. viscose of a dithio-carbamate of formula—



(M = monovalent metal or monovalent basic radical,  $R^1 = H$  or an aliphatic hydrocarbon radical; and when

$R^1 = H$ ,  $R =$  aliphatic or cycloaliphatic hydrocarbon radical, a monoalkylene monoamine chain, a dialkylene monoamine chain, a polyalkylene polyamine chain or a substituted polyalkylenepolyamine chain; where  $R^1 =$  aliphatic hydrocarbon radical  $R =$  aliphatic or cycloaliphatic hydrocarbon radical, or an aliphatic hydrocarbon radical joined to  $R^1$  to form with  $R^1$  a closed aliphatic hydrocarbon chain;  $R$  has valency  $= n \leq 1$ . The extrusion bath contains  $H_2SO_4$ ,  $Na_2SO_4$  and  $ZnSO_4$ . The resulting filaments have a non-orelated surface, a bean-shaped cross-section, and a thicker skin. J.W.B.

#### Vinylidene Chloride-Vinyl Chloride Copolymer

Dow Chemical Co.

BP 739,411

A fibre-forming copolymer which can be dyed or pigmented to white and which does not darken upon extrusion or exposure to light contains 88-94% of vinylidene chloride and 12-6% of vinyl chloride together with (on the wt. of the copolymer) 0.5-5.0% of tetrasodium pyrophosphate, 2-6% of phenylsalicylate and 1-5% of acetyltriethyl citrate, the combined salicylate and citrate being  $\geq 9\%$  by wt. of the whole. C.O.C.

#### Treating Polymers with High-energy Ionising Radiations

United Kingdom Atomic Energy Authority

BP 739,709

A polymer which has been largely orientated by cold drawing is set in its orientated form by treating it with high energy radiations, e.g. irradiated in a nuclear reactor. C.O.C.

#### Coated Glass Fibres

B. F. Goodrich Co.

BP 738,869

Glass fibres are enabled to adhere more tenaciously to binder materials, e.g. rubber, if they are first coated with a metal, e.g. Cu or a 99:1 Zn-Ti alloy, and then with a lubricant, e.g. a coating of stearic acid or an oxide of the metal. C.O.C.

Solutions of Acrylonitrile Polymers (III p. 31)

### VII—DESIZING; SCOURING; CARBONISING; BLEACHING

#### Light Scattering and Micelle Structure in the System Sodium Dodecyl Sulphate-Sodium Chloride-Water

L. M. Kushner and W. D. Hubbard

*J. Colloid Sci.*, 10, 428-435 (Oct. 1955)

Light scattering measurements have been made on solutions of sodium dodecyl sulphate in water and in salt solutions up to 0.2 M. Micelle weights increase from 11,000 in water to 24,000-27,000 in the presence of 0.06-0.2 M. sodium chloride. The dependence of micelle weight on sodium chloride concentration is discussed. W.R.M.

#### Foaming of Sodium Laurate Solutions

M. Camp and K. Durham

*J. Physical Chem.*, 59, 993-997 (Oct. 1955)

The effects of additions of electrolytes on foam stability, surface tension, and surface viscosity of 0.1% solutions of sodium laurate at pH 10 have been studied. The electrolytes used had no significant effect on surface viscosity, but with increasing concentration produced a progressive lowering of surface tension. The size and the concentration of hydrated cations were found to influence foam stability, the alkali metals increasing in the order  $Li^+ < Na^+ < K^+ < Cs^+$ . Anions were found to influence foam stability in the order  $I^- < OH^- < SO_4^{2-} < NO_3^- < CO_3^{2-} < SiO_3^{2-} < Cl^-$ . Addition of phosphates caused marked increases in foam stability even at low concentrations. Factors influencing foam stability are discussed. W.R.M.

#### Coagulation and Peptisation of Polyelectrolyte Solutions by Detergent Ions—I

S. Saito

*Kolloid-Z.*, 143, 66-73 (Sept. 1955)

Aqueous solutions of polyacrylic acid are coagulated or peptised by varying concentrations of added cationic detergent ions. Using the homologous series of alkylamine chlorides at a given polymer concentration there is a linear relationship between the logarithm of the coagulation value and the number of carbon atoms in the alkyl radical, except with higher homologues. Peptisation by alkyltrimethylammonium chlorides leads to fibre formation, whereas alkylamine chlorides lead to strongly coiled

molecules. The amount of detergent ions absorbed by the polymer in coagulation or peptisation decreases with increasing size of the alkyl radical. Coagulation and peptisation are similarly affected in spite of variations in such solution conditions as concentration or degree of neutralisation. W.R.M.

#### Historical Notes on the Wet-processing Industry IX—Contributions of Francis Home and Joseph Black to the Bleaching Industry

S. M. Edelstein

*Amer. Dyestuff Rep.*, 44, 681-684 (26 Sept. 1955)

#### PATENTS

#### Treating Grey Cotton before Bleaching

International Cellucotton Products Co.

BP 739,172

The material is treated with a dilute solution of a hydrophilic wetting agent containing a high mol.wt. organic hydrophobic group, e.g. sodium di(2-ethyl hexyl)phosphate, before being bleached, while maintaining the oil and wax content of the cotton at  $< 0.4\%$ . This results in the bleached cotton being soft and readily wettable. C.O.C.

#### Bleaching Vegetable Fibres

Société Anonyme Geernart & Matthys Frères

BP 739,810

Modification of BP 704,111 (J.S.D.C., 70, 207 (1954)). Vegetable fibres are treated in an alkaline bath containing an alkyl ester of an aryl monosulphonic acid, preferably the nonylic ester of naphthalene monosulphonic acid, before being treated with chlorine. A much better bleach is obtained. C.O.C.

#### Bleaching Cellulosic Textiles

Deutsche Gold- und Silber-Scheideanstalt

BP 738,903

The material is repeatedly and thoroughly impregnated with an aqueous solution of a chlorite at 60-100°C. for 3-25 min. Excess liquor is squeezed off and the material passed continuously in folds in a closed heat-insulated chamber, the time of passage through the chamber being 5-15 times as long as that for which the material was in the chlorite solution. This allows complete utilisation of the chlorite and saving in labour, time and steam. C.O.C.

Soiling of Carpets (X p. 39)

### VIII—DYEING

#### Continuous Dyeing with Direct Cotton Dyes

A. Schmitz

*Z. ges. Textilind.*, 57, 1131-1134 (5 Sept. 1955)

Continuous dyeing with substantive dyes by the pad-steam and pad-roll techniques is discussed. With the pad-steam process the following equation gives the concn. of dye required for strengthening up the padding liquor—

$$C_s = \frac{(C_f - C_{ex}) \times 100}{\text{Uptake of liquor}}$$

( $C_s$  = concn. of liquor for strengthening;  $C_f$  = concn. of dyebath for trial dyeing;  $C_{ex}$  = concn. of dye in exhaust liquor; all concn. in g./litre). In both processes the solubility and the degree of aggregation of the dyes in concn. soln. play an important part in their selection for use. B.K.

#### Notes on Package Dyeing

E. Caswell

*Amer. Dyestuff Rep.*, 44, P 561-P 565 (15 Aug. 1955)

Package dyeing of cotton, spun rayon staple, elastic nylon, and blends of Terylene with wool or cotton is discussed and full recipes are given. Mention is made of boiling out cotton with acetic acid, perborate semi-bleaching, dyeing with peroxide-stable direct dyes, pigment filter tests for vat dyes, and the relevelling of vat dyes on packages. J.W.B.

#### Dyeing of Cellulose Triacetate Fibres with Disperse Dyes

J. Eisele and W. Federkiel

*Melliand Textilber.*, 36, 1036-1041 (Oct. 1955)

Celliton Fast (BASF) dyes are considered. There is no fundamental difference in dyeing behaviour between

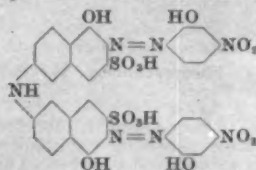




(10) is mixed with glycoceoll (1) and crystalline sodium tetraphosphosphate (9) to give a product which dyes cotton yellow brown.

BP 737,806

The metallisation of similar dyes whose metal-complexes are of low solubility may be carried out in the dyebath in the presence of P-containing anions of a phosphoric acid  $H_{3-x}P_2O_{3x+1}$ , and in the absence of amino acids or amino-hydroxy compounds. Thus the diazo dye—



is applied to cotton in the presence of  $CuSO_4 \cdot 5H_2O$  (I) and  $Na_2P_2O_7 \cdot 10H_2O$  (II) (1 part of dye to 20 parts by volume of a soln. of 4.28 parts of I and 15.4 parts of II in 90 parts of water) to give a deep blue.

E.S.

#### Mélange Effect produced by Dyeing

Maifoss

BP 740,003

Modification of BP 680,862 (J.S.D.C., 69, 36 (1953)). The wool is treated with an aqueous solution containing (a) a compound of formula  $R^1-CO-R^2$ ,  $R^1-SO_2-R^2$ ,  $R^1-CH(R^3)-R^2$  or  $R^1-CH(R^3)-CX_2$  ( $R^1$ ,  $R^2$  and  $R^3$  = same or different, subst. or unsubst. Ar;  $X$  = same or different Hal; those of the first two formulae contain at least one sulphonic group), (b) acetic, hydrochloric, sulphuric, formic, phosphoric or lactic acid or an ammonium salt thereof, and (c) a wool dye containing >1 sulphonic group. Thus wool fabric (100 g.) is treated at 49°C. in an aqueous bath containing 80% acetic acid (5), Lance CN (ICI) (1), and Glauber's salt (10). Then Carmoisine LS (ICI) (0.5) was added and the bath brought to the boil and boiled for 40 min., the ratio of liquor to goods being 20 : 1. A red fleck effect was obtained.

C.O.C.

Dyeing and Finishing Rayon-tufted Carpets (I p. 28)

Drying Rayon Cakes (I p. 28)

Condensates for Improving the Fastness of Direct Dyeings or Prints (III p. 30)

Moth- and Rot-proofing Agents (III p. 30)

Steric Effects in Dyes (IV p. 31)

Phototropy of New Photosensitive Complexes between a Fluorescent Pigment and Mercapto Compounds (Thiols) (IV p. 32)

Day-to-day Problems in the Hatting Industry (VI p. 35)

## IX—PRINTING

### Alcian X Dyes in Textile Printing

W. Clarke

Canadian Textile J., 72, 57-62 (7 Oct. 1955)

A brief review of the chemistry of Alcian Blue 8G and of improved types, of which a blue, a yellow, and two greens are available, yielding deeper shades of better light and wash fastness. Methods of application are given and the probable mechanism of fixation is discussed. Recent observations on the behaviour in screen and roller printing are mentioned, and compatibility and order of printing with other dyes in multicolour roller printing are fully described.

A.H.

### Screen Printing of Bright Golds on Glass or Glazed Ceramics

Ceramic Industry (U.S.A.), 92 (Oct. 1954)

E.P.A. Technical Digest No. 59

An account of the application of metallic gold (hardened with rhodium) by screen printing. The gold in the form known in the U.S.A. as Squegee Gold is applied in an organic vehicle which burns off during firing. The mirror-bright film of 22 carat gold is less than 4 millionths of an inch thick and after firing resists abrasion and solvents. For rapid prints—45-60 prints per min.—the paste should be rather stiff as too thin a paste tends to deposit too much gold.

C.O.C.

## PATENTS

### Two-colour Prints

Springs Cotton Mills

BP 740,291

One of the colours is printed onto the fabric and immediately after the print has been applied the fabric passes through a dyebath. The printing paste of the prints acts as a resist for the dye liquor. Thus a polka dot is printed on to cotton cloth using per 10 gal. printing paste Kelgin (algin) (116), Indigosol Blue IBC paste (0.8), Indigosol Red IFBB powder (0.03),  $NaNO_2$  (2), Dehagon (urea) (0.75), Triton W-30 (aryalkylether sulphate) (2 oz.). Immediately after leaving the printing roller the cloth passes into a bath at 160°F. containing per 40 gal. Indigosol Blue IBC paste (1.6 lb.), Indigosol Red IFBB powder (0.06 lb.),  $NaNO_2$  (6), Dehagon (2), Triton W-30 (6 oz.). This yields dark spots on a light background.

C.O.C.

### Reduction Discharges

Ciba

BP 738,668

Cupriferous dyes on cellulose are discharged by using a paste containing a reducing agent, a water soluble cyanide and a water-soluble quaternary ammonium salt derived from a tertiary amine and an alkyl halide. Thus cotton dyed with sulphonated copper cyanide and aftertreated with a formaldehyde-dicyandiamide condensate is discharged to white by using a paste made up of sodium formaldehyde sulphonylate (15), 1 : 1 gum arabic thickening (50), glycerine (5),  $K_2CO_3$  (6), calcium salt of the disulphonic acid of dimethylphenylbenzylammonium chloride (10), anthraquinone (1), KCN (3), and water (10).

C.O.C.

### Knitwear Printing

Samar Machines

BP 736,650

A screen-printing machine for knitted footwear in which the hose are presented by a rotatable mandrel to the underside of the screen stencil mounted on a reciprocating carriage.

G.E.K.

### Printing on Transparent Material

Transart

BP 739,836

### Direct Production of Images by Direct Transfer of Pigment from a Surface bearing both Pigment and Light-sensitive Material

Chemische Fabrick L. van der Grinten

BP 740,165

A surface coated with pigment and a light sensitive material is exposed and then pressed against another surface so as to transfer to it the pigment image.

C.O.C.

### Production of a Pigment Image on a Receiving Surface

Chemische Fabrick L. van der Grinten

BP 740,166

A light-pervious sheet has distributed over it a reflectographic light screen and light sensitive material. The opaque parts of the screen are composed of pigments and the light sensitive material has its adhesive power altered in exposure to light. The whole is exposed to light in the manner of screen reflectography. The surface to receive the image is then pressed against the exposed side of the sheet under conditions selectively rendering exposed portions of the light sensitive coating more adhesive to the surface to be printed and so transferring the pigment image to it.

C.O.C.

### Multicolour-separation Printing Plates and Method of Multicolour Printing

Fairchild Camera &amp; Instrument Corp.

BP 739,665

### Decorating Thermosetting Synthetic Resin Articles

Fairway Aviation Co.

BP 739,801-3

Paper bearing a transfer is applied to the article before it is cured so that the transfer becomes embedded in the article by the compression used in curing.

C.O.C.

### Magnetic Printing

Stromberg-Carlson Co.

BP 740,162

A pattern is magnetically impressed on a magnetic member. This member is then coated with a layer of dry, powdered magnetic substance so that it adheres with greater density to the portions impressed with the pattern. The coated member is then applied under sufficient pressure to transfer the coating to the dry non-sticky material to be printed.

C.O.C.

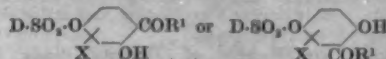


**Light-sensitive Material for the Photochemical Production of Printing Plates**

Kalle &amp; Co.

BP 739,654

Aluminium foil is coated with compounds of formula—



(D = naphthoquinone-(1:2)-diazide residue; X = H or OH; R<sup>1</sup> = H, OR<sup>2</sup>NR<sup>3</sup>R<sup>4</sup> or subst. or unsubst. Alk, Ar or heterocyclic residue (R<sup>2</sup> = Alk or Ar; R<sup>3</sup> and R<sup>4</sup> = H or Alk or Ar) as the light sensitive agents, e.g. 2:3:4-trihydroxybenzophenonenaphthoquinone-(1:2)-diazide-(2)-5-sulphonic acid ester dissolved in glycol monomethyl ether. C.O.C.

**Colour Photography**

B. Gaspar

USP 2,699,394

The metal image in a photographic emulsion diffusely coloured with an azo dye is treated with a solution containing R<sup>1</sup>SO<sub>3</sub><sup>-</sup> ions (R<sup>1</sup> = an organic radical or R<sup>2</sup>R<sup>3</sup>N (R<sup>2</sup> and R<sup>3</sup> = same or different H or organic radical) which do not affect the dye but oxidise the metal with simultaneous production of a substance which destroys the dye at the metal image by reduction, e.g. sulphamic acid. C.O.C.

**Colour Photography**

Kodak

BP 739,913

When producing three-colour photos by the method of BP 599,377 (J.S.D.C., 64, 321 (1948)) use of 3-azobis[1-(p-sulphophenyl)-3-n-octyl-5-pyrazolone], 1-(p-sulphophenyl)-3-methyl-4-(1'-phenyl)-3'-benzamido-5'-oxo-2'-pyrazolyl-4'-azo)-5-pyrazolone, 1-(4-tert-butylphenoxyphenyl)-3-[a-(4-tert-butylphenoxy)-propionamido]-4-(1'-p-sulphophenyl)-3'-methyl-5'-oxo-2'-pyrazolyl-4'-azo)-5-pyrazolone or 4-azobis[1-(p-sulphophenyl)-3-methyl-5-pyrazolone] as the coupler for the magenta image and/or 2:2'-di-(2:4-di-tert-aminylphenoxy acetamido)-5:5'-dimethyl-6:6'-dichloroazodiphenol or 1-hydroxy-2':5'-dibutoxy-4-(4-hydroxy-2-n-pentadecyl-phenylazo)-2-naphthanilide as the coupler for the cyan image increases the amount of dye obtained from them compared with that obtained from the couplers of BP 586,211, 598,657, 598,174 and 627,814 (J.S.D.C., 64, 321, 290, 260 (1948); 66, 156 (1950)). C.O.C.

**Colour-corrected Photographic Multilayer Negative Image**

Gevnert

BP 738,978

Method of producing a photographic colour masking image in one of the image-bearing layers of a photographic multilayer material after it has been colour developed. C.O.C.

**Black Printer for Use in Reproducing a Multi-coloured Original**

Eastman Kodak Co.

BP 739,397

**Colour Photography**

AGFA A-G. für Photofabrikation

BP 739,202

**Colour Correction utilising Integral Masking**

DuP.

USP 2,697,662

**Preventing Colour Fog or Stain in Colour Photography**

Kodak

BP 738,683

**Photographic Transfer Process using a Primary Colour Developer for producing a Coloured Photographic Transfer Image**

Polaroid Corp.

USP 2,698,244

Condensates for Improving the Fastness of Direct Dyeings or Prints (III p. 30)

Inks and Processes for Printing on Tinplate, Aluminium, Brass, etc. (V p. 34)

**X—SIZING AND FINISHING****Dimensional Stabilisation of Textile Fabrics**

N. A. Matlin and A. C. Nussle

Ind. Eng. Chem., 47, 1729-1739 (Sept. 1955, Part I)

A critical review of the mechanisms of shrinkage of cellulosic and wool fabrics and of chemical processes for minimising shrinkage. The application and the effectiveness of the following stabilisation treatments are discussed:

urea- and melamine-formaldehyde resins, cyclic urea resins, thiourea- and formamide-formaldehyde resins, formaldehyde, glyoxal, and other aldehydes, and non-aldehyde treatments on cotton and viscose rayon; aqueous halogenation, non-aqueous halogenation, oxidation, alkali, reduction and enzymes, thermosetting, urethane and amide resins, and thermoplastic polymers on wool. There are 69 references. W.K.R.

**Recent Developments in Cotton Finishing**

G. M. Gantz

Amer. Dyestuff Rep., 44, P 550-P 556 (15 Aug. 1955)

A comprehensive review is presented on the finishing of broad-woven cotton fabrics, with emphasis on recent developments; lustring, fluorescent brightening, stiffening, softening, absorbency, and resistance to abrasion, creasing, mildew, water, and flame are discussed. J.W.B.

**Application of Wrinkle-resistant Finishes to Cotton**

H. C. Borghetty

Amer. Dyestuff Rep., 44, P 557-P 560 (15 Aug. 1955)

A brief survey is presented of the requirements and application of resins on cotton. J.W.B.

**Soiling of Carpets**

Z. Sudnik

J. Textile Inst., 46, T 668-T 670 (Oct. 1955)

Eight samples of Spool Axminster carpet, of pile composition 100% wool and 50% wool-50% Tufton, -50% Cuprama, and -50% Fibro respectively, and each type with 6% and 1.5% of oil in the jute yarn, are soiled artificially (tumbler) and by a passage-way service test. Degree of soiling is measured by a reflectance meter, and the two methods agree well. The order of increasing soiling is wool < wool-Tufton < wool-Cuprama < wool-Fibro. Soiling is less with the low oil content than with 6%, and it appears that wicking takes place from the jute backing. This is supported by an elementary test in which the wicking action of an oil emulsion, measured by vertical travel up a suspended yarn, is least with wool and most with Fibro-wool. A number of finishes are examined, and it appears that Syton W20 (Monsanto) is effective; by applying this and using a jute yarn of low oil content a blended wool-Fibro pile remains as clean as or cleaner than an all-wool pile after 70 days' intensive use. J.W.B.

**Heat-setting Nylon Fabrics**

N. B. Furvik, A. Bernsköld, and N. Gralén

J. Textile Inst., 46, T 662-T 667 (Oct. 1955)

The degree of heat-setting of nylon fabrics is assessed by measuring resistance to creasing, in terms of creasing angle. The effects of temp. and time of setting, and of the time of creasing, are studied, and it is shown that crease-resistance increases with increased setting time and temp. Resistance is better after setting in steam than after dry setting; e.g. the same results are obtained at 134°C. for 2 min. in steam, and at 220°C. for 30 sec. or 205°C. for 2 min. when dry. J.W.B.

**Rotproofing and Weathering Properties of Some Compounds of Dehydroabietylamine**

G. R. F. Rose and C. H. Bayley

Amer. Dyestuff Rep., 44, 648-651, 676 (12 Sept. 1955)

The permanence to outdoor weathering is studied of Cu and Zn complexes of dehydroabietylamine in association with 2-ethylhexoic acid and 8-hydroxyquinoline and of dehydroabietylammmonium pentachlorophenoxide as applied to cotton duck. Cuprammonium fluidity and loss in breaking strength are taken as a measure of the tendency of the compounds to enhance or suppress actinic degradation. Fungicidal effect is assessed by soil burial, and a comparison is made with the behaviour of fabric treated with Cu naphthenate and Cu 8-hydroxy-quinolinolate. The metal complexes lose almost all the metal on weathering, a tendency which is reduced by incorporation of wax, but appear not to enhance actinic breakdown. The level of protection against microbiological attack of the Cu complex is intermediate between those given by Cu naphthenate and by Cu 8-hydroxy-quinolinolate. The protection conferred by the Zn complex is surprisingly high and warrants the inclusion of this type of Zn compound in the range of effective colourless fungicides. Poor resistance to weathering is shown by the pentachlorophenoxide and is not improved by wax treatments, but in the absence of weathering there

is good microbiological protection. If the Cu complex is applied on top of a mineral (Cr) treatment there is subsequently markedly smaller loss of Cu and less actinic degradation.

J.W.B.

#### Distribution of Phosphorus during Processing and Charring of Cotton Fabric treated with Tetrakis-hydroxymethylphosphonium Chloride and Resins

M. F. Stansbury and C. L. Hoffpauir

Amer. Dyestuff Rep., 44, 645-647, 676 (12 Sept. 1955)

A flameproofing solution containing 16-65% of commercial T.H.P.C., 3-01% triethanolamine, 9-53% trimethylolmelamine, 9-93% urea, and 60-88%  $H_2O$  is prepared—P content 2-44% by analysis. An 8-oz. twill is treated to give a wet pick-up of 67-77%, analysis showing no selective adsorption. The fabric is dried and cured in an apparatus which permits any P compounds evolved to be trapped in an absorption train. Samples of fabric are also analysed at the different stages, including after washing. Charring is carried out on fabric treated with T.H.P.C.-trimethylolmelamine-urea and on phosphorylated cotton sheeting prepared by the phosphoric acid-urea method, and analyses of evolved and residual P are made. Relatively small amounts are evolved during drying and curing of T.H.P.C.-processed fabric, approx. 0-0003 and 0-0002% of phosphine P being found among them during drying and curing respectively. Considerably larger quantities of P are removed during washing. A large proportion remains in the fabric during charring, and of the remainder only 0-0019% is evolved as non-condensable  $PH_3$ . No  $PH_3$  is evolved from the phosphorylated cotton. Even these minute amounts make adequate ventilation essential during curing.

J.W.B.

#### PATENTS

##### Conditioning Fibrous Materials

Aktiebolaget Svenska Fläktfabriken

BP 739,025

Porous fibrous material is conditioned, in particular heated, by direct contact with a heat exchange surface, compressing the material between this and a relatively moving surface, and then releasing the pressure so that the material opens up and there is thus no forced diffusion. This procedure is applied several times, one of the surfaces being controlled at the required temperature. A suitable machine comprises a large drum into which the material is fed and inside which on a parallel but off-set axis is mounted a smaller rotating drum; the eccentric setting permits alternate compression and release as the material circulates.

J.W.B.

##### Copolymers of Melamine, Guanidine or Urea with Tetrakis(hydroxymethyl)phosphonium Chloride (T.H.P.C.), or Tris(hydroxymethyl)phosphine Oxide (T.H.P.O.)—Flameproofing Agents and Thermosetting Resins: Flameproofing Aminised Cotton with T.H.P.C. or T.H.P.O.

Albright &amp; Wilson Ltd.

BP 740,269

Thermosetting resins are produced by reacting melamine guanidine or urea with tetrakis(hydroxymethyl) phosphonium chloride (T.H.P.C.) or tris(hydroxymethyl) phosphine oxide (T.H.P.O.). Such resins are suitable for moulding. Fibrous materials may be flameproofed by impregnating them with a precondensate of the above compounds and then curing. Cellulose containing primary amino groups, e.g. aminised cotton, is flameproofed by treatment with T.H.P.C. or T.H.P.O. alone.

C.O.C.

##### Coated Nylon Fabrics having Low Infrared Reflectance

ICI

BP 738,831

Modification of BP 690,706 (J.S.D.C., 69, 269 (1953)). Incorporation in the composition of a pigment having good infrared absorption, e.g. Pigment Green B (FeNa salt of nitroso- $\beta$ -naphthol), Carbon Black, chlorinated copper phthalocyanine, hydrated iron oxide, Aniline Black, Prussian Blue and Black or Indian Red iron oxides, yields coatings which have a lower infrared reflectance over a much broader spectrum than do fabrics dyed with dyes having maximum infrared absorption.

C.O.C.

##### Polyacrylonitrile Sewing Thread

Coats &amp; Clark

USP 2,698,817

Fusion breaks when sewing at high speeds with polyacrylonitrile thread can be avoided by impregnating the thread with an organosilicon compound, e.g. an 18% by weight chloroform solution of dimethylsilicone.

C.O.C.

##### Permanently Stiff Finish

Monsanto

USP 2,698,264

The material is treated first with an aqueous solution or dispersion of an alkaline or amine salt of a styrene-maleic anhydride copolymer and then with a dilute solution of a metal salt. After drying a permanent stiff finish results, which is resistant to washing.

C.O.C.

##### Improving the Handle of Textiles made from Regenerated Protein Fibres mixed with other Fibres

American Patents Corpn.

BP 738,687

The materials are treated in hot water. This causes frissures (crimps) to form in the regenerated protein fibres, this action being accelerated if a small quantity of a neutral or acid salt, e.g. any ammonium salt, is added to the bath. It imparts a full handle together with, to some extent, a crease-shedding property.

C.O.C.

##### Air- and Water-vapour-permeable, Waterproof Coated Fabric

United States Rubber Co.

USP 2,698,816

One side of the fabric is calendered with a putty-like mixture of rubber, wool or cotton flock, a water-repellent material for the flock and a volatile organic solvent for the rubber and the water-repellent material. Finally the solvent is dried off and the resultant coating cured.

C.O.C.

##### Apparatus for making Pile Fabric

Alexander Smith

USP 2,698,044

Warp yarns are passed from end to end along a drum during which time they are treated with a quick drying adhesive. Pile yarn is wrapped around the drum over the warp yarn to which it is secured by the adhesive.

USP 2,698,045

Thermoplastic warp yarn is fed along the drum and pile yarn wrapped round it and caused to adhere to the warp yarn by heat and pressure.

C.O.C.

##### Rotproof Finish

Pacific Mills

USP 2,698,263

The material is treated with an oil-in-water emulsion of a solution of copper-8-quinolate or similar oil-soluble copper compound in oil. The amount of copper compound used may be considerably reduced if the material is simultaneously or subsequently treated with an organo-mercury compound.

C.O.C.

Dyeing and Finishing Rayon-tufted Carpets (I p. 28)

Day-to-day Problems in the Hatting Industry (VI p. 35)

Treating Polymers with High Energy Ionising Radiations

(VI p. 36)

## XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Moth- and Rot-proofing Agents (III p. 30)

## XIII—RUBBER; RESINS; PLASTICS

Polyvinylpyrrolidone and its Applications (III p. 29)

Dialysable Derivatives of  $\gamma$ -Aminobutyric Acid in Polyvinylpyrrolidone (III p. 30)

Vinyl Fluorinated Alkyl Ethers and their Polymers (III p. 31)

Solutions of Acrylonitrile Polymers (III p. 31)

Treating Polymers with High Energy Ionising Radiations (VI p. 36)

Decorating Thermosetting Synthetic Resin Articles (IX p. 38)

Copolymers of Melamine, Guanidine or Urea with Tetrakis(hydroxymethyl)phosphonium Chloride (T.H.P.C.) or Tris(hydroxymethyl)phosphine Oxide (T.H.P.O.)—Flameproofing Agents and Thermosetting Resins: Flameproofing Aminised Cotton with T.H.P.C. or T.H.P.O. (X this page).

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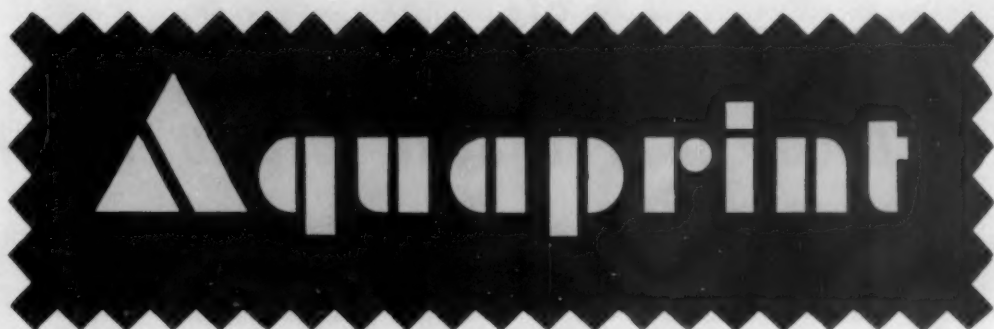
Protective Action of Wool Wax and Suint against the Photolysis of Wool (VI p. 35)

Day-to-day Problems in the Hatting Industry (VI p. 35)

Soiling of Carpets (X p. 30)

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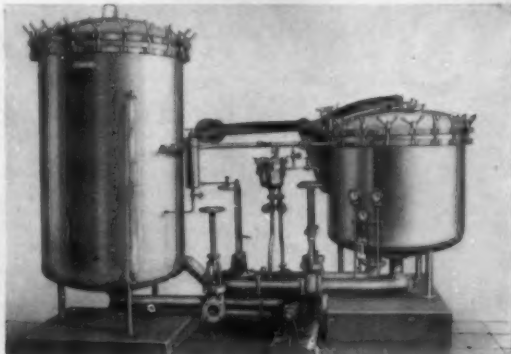
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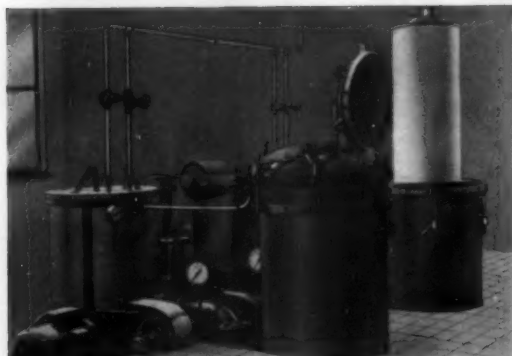
500 lb capacity units for Fast Colour Dyeing Cotton Yarns in Cheese and Cone



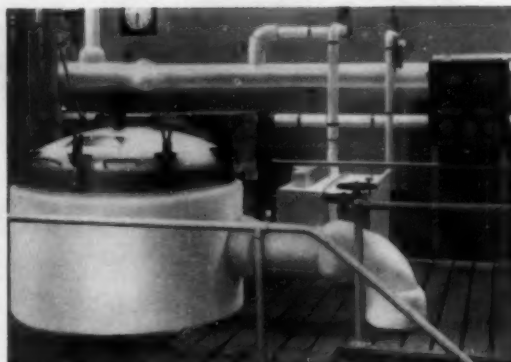
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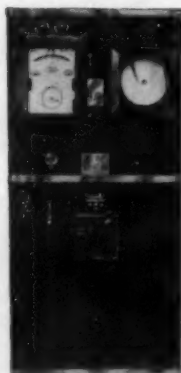


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## SITUATIONS VACANT AND WANTED etc

The Publications Committee is prepared to receive Advertisements relating to SITUATIONS VACANT, SITUATIONS WANTED, or MISCELLANEOUS ITEMS for insertion on this page of the Journal. Advertisements of Situations Wanted are gratis to individual members, but must not exceed twenty-four words in length.

All inquiries relating to Advertisements in the Journal should be addressed to THE GENERAL SECRETARY, THE SOCIETY OF DYERS AND COLOURISTS, DEAN HOUSE, 19 PICCADILLY, BRADFORD 1, YORKSHIRE.

Replies may be addressed Box —, THE SOCIETY OF DYERS AND COLOURISTS, DEAN HOUSE, 19 PICCADILLY, BRADFORD 1, YORKSHIRE, where all communications relating to these Advertisements are treated in strict confidence.

### SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is exempted from the provisions of the Notification of Vacancies Order 1963.

**ASSISTANT DYER** for progressive post. Would suit young man with some training in technology and with ability to control small staff. Ideal for laboratory trained man wishing to get onto production side. Superannuation scheme. W. J. & T. Lambert & Co. Ltd., Talbot Street, Nottingham.

**COLOUR CHEMIST.** Tootal Broadhurst Lee Co. Ltd. have a vacancy in their Headquarters Testing Department for work in colour chemistry and application of dyestuffs. A degree in Colour Chemistry or B.Sc. (Tech.) or equivalent are essential qualifications; experience in textile testing is not essential. Apply giving details of age, education, qualifications and experience to the Personnel Manager, 66 Oxford Street, Manchester.

**LABORATORY ASSISTANT** required for firm of Bleachers and Finishers for Cotton and Rayons in the Manchester area. Must have completed National Service. Write stating age and qualifications Box V94.

**LARGE** vertically integrated firm of textile spinners, weavers, dyers and finishers have a vacancy for a Dyer thoroughly experienced in the dyeing of vats, azoics, sulphurs, and directs on packages to take charge of extensive beam, cone, loose stock and Indigo Dyeing Plant. Applicants should be 20/50 years of age. Excellent salary and prospects. Apply David Whitehead Fabrics, P.O. Box 1, Lower Mill, Rawtenstall, Rossendale.

**TECHNICAL DYEING LABORATORY.** Vacancies occur for three first-class assistants in this department. Applicants should possess good knowledge of Chemistry and Dyeing, and have completed National Service. Excellent prospects. Write stating particulars of age, experience and salary required, to L. B. Holliday & Co. Ltd., Deighton, Huddersfield.

**W. R. GRACE & CO.** require an experienced DYER HOUSE MANAGER age 35-40 for services in Peru, South America, with a sound scientific approach to dyeing problems. Experience of dyeing cotton, spun rayon and mixtures of all synthetic fibres, and the use of vats, azoics, direct and pigment, is essential. Working knowledge of bleaching and screen printing would be an advantage. Salary fully commensurate with the position. House provided. Applications in confidence to Managing Director, Grace Brothers Ltd., 143/9 Fenchurch Street, London, E.C.3.

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### MISCELLANEOUS

THE Society has several urgent requests for January to June 1955 issues of the Journal. If any member wishes to dispose of any of these copies, the Society will re-purchase them at 2s per copy. Replies to be addressed to the General Secretary, Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1.

## Combined Reports of the Committees on the Dyeing Properties of Direct Cotton, Vat, and Wool Dyes

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### FORTHCOMING MEETINGS OF THE SOCIETY—continued from page x

Friday, 23rd March 1956

LONDON SECTION. *Dyeing of Narrow Fabrics—Cellulosic and New Fibres.* Dr. I. M. S. Walls (I.C.I. Ltd.). George Hotel, Luton. 7 p.m.

Saturday, 24th March 1956

NORTHERN IRELAND SECTION. Annual General Meeting and Dinner. Details later.

Tuesday, 10th April 1956

SCOTTISH SECTION. *Textile Invention and the Dry Cleaner.* A. J. Crockett, Esq., M.Sc., F.R.I.C. (Eastmans Dyers and Cleaners Ltd.). St. Enoch's Hotel, Glasgow. 7 p.m.

Friday, 20th April 1956

MANCHESTER SECTION. *The Mechanism of Jigger Dyeing.* Dr. Ashworth. Textile Institute, 10 Blackfriars Street, Manchester 10. 6.30 p.m.

Friday, 20th April 1956

LONDON SECTION. Fourth London Lecture. *Colour in Fashion.* James Laver Esq. (Keeper of the Departments of Textiles and Engraving, Illustrations and Design, The Victoria and Albert Museum. (Waldorf Hotel, London, W.C.2. 7 p.m. To be followed by a Dinner.

Saturday, 21st April 1956

BRADFORD JUNIOR BRANCH. Annual General Meeting. Technical College, Bradford. 10.15 a.m.

Wednesday, 25th April 1956

HUDDERSFIELD SECTION. Visit to Messrs. Stevensons Dyers Ltd., Ambergate, Derbyshire.

MIDLANDS SECTION. *A New Approach to High Temperature Dyeing.* S. N. Bradshaw, Esq. Kings Head Hotel, Loughborough. Preceded by the Annual General Meeting of the Section. 6.30 p.m.

## MEMBERS' CHANGES OF ADDRESS

- Alsberg, F. R., formerly of 139 Heywood Road, Prestwich, to 141 Heywood Road, Prestwich, Manchester
- Anstead, D. F., formerly of 103 Mashiters Walk, Romford, to 99 Victoria Road, Romford, Essex
- Brooks, F., formerly of 8, Zoraster & Co., Johari Bazar, Jaipur, India, to 45 Lower Fold, Marple Bridge, Cheshire
- Budding, J., formerly of 87 Royal Park Avenue, Leeds 6, to 34 Ash Road, Headingley, Leeds 6
- Butland, R. A., formerly of 76 Ashfield, Tranmere Park, Guiseley, near Leeds, to 10 Lothian Drive, Clarkston, Renfrewshire, Scotland
- Brinkworth, R. A., formerly of 87 Royal Park Avenue, Leeds 6, to 34 Ash Road, Headingley, Leeds 6
- Chong, Yoke, formerly of The Provincial Institute of Textiles, 196 Wentworth Street N., Hamilton, to 1670 Franklin Street, Vancouver 6, B.C., Canada
- Coyne, J., formerly of Sheffield Road, Glossop, to c/o Tootal Broadhurst Lee Co. Ltd., P.O. Box 149, Devonport, Tasmania
- Egan, M. J., formerly of St. Bonaventures, Cambridge, to 9 Ellastone Road, Salford 6, Lancs.
- Hovland, H., formerly of 60 Meadow Lane, Loughborough, to 77 Meadow Lane, Loughborough
- Subramaniam, C. R., formerly of Calicut, St. Malabar, India, to Paratay Mills, Amalner E.K., India
- Toy, Dr., formerly of The British Cotton Ind. Res. Ass., Didsbury, Manchester 20, to Tregays, Fletsand Road, Wilmslow, Cheshire

## ADDRESSES WANTED

- Crook, B., formerly of 196 Wentworth Street, W., Magog, Quebec
- Crowther, D., formerly of 551 Leeds Road, Thackley, Bradford
- Geo, B. C., formerly of 2 Cherryhill Drive, Ballyregan Road, Dunronald, Belfast, Northern Ireland
- Green, A. N., formerly of 19 Salcombe Road, Basford, Nottingham
- Hatton, C. A., formerly of 206 Blackpool Road, Lea, near Preston
- Hillier, R. F., formerly of Kingscote, Locker Lane, Slyne Road, Lancaster, Lancs.
- Kesprek, A. E., formerly of 15 Huntley Street, Hamilton Street, Ontario, Canada
- Kupczyk, J., formerly of 5 Rutland Grove, Farnworth, Lancs.
- Levy, J. B., formerly of Lowell Textile Institute, Lowell, Mass., U.S.A.
- Meier, P. W., formerly of Oberwilerstrasse 33, Basle, Switzerland
- Moore, G., formerly of 20 Welwyn Avenue, Wrose, Shipley
- Morrison, A., formerly of America Woollen Co., P.O. Box 930, Lawrence, Mass., U.S.A.
- Partington, G., formerly of Textile Department, Ontario Research Foundation, 43 Queens Park, Toronto 5, Ontario, Canada
- Stamires, D., formerly of 9 Shaw Lane, Leeds 6
- Standring, Dr. P. T., formerly of I.C.I. Ltd., 1200 St. Alexander Street, Montreal, Canada
- Stevenson, Mrs. M., formerly of 46 Mountside Crescent, Prestwich, near Manchester
- Stiasany, K., formerly of 70 Bialik Street, Ramat Gan, Israel
- Swift, F. S., formerly of 3 St. Annes Street, Ennis, Co. Clare, Eire
- Vaterlaus, A., formerly of 22 Third Avenue, Bonhill, Alexandria, Dumbartonshire
- a Viscosa, C. I. S., formerly of Dvozione Centrale degli Etabiliment (Dott. Calandra), Via Sicilia 162, Roma, Italy
- Warchol, W., formerly of 14 Sparford Avenue, off Wollaton Road, Nottingham

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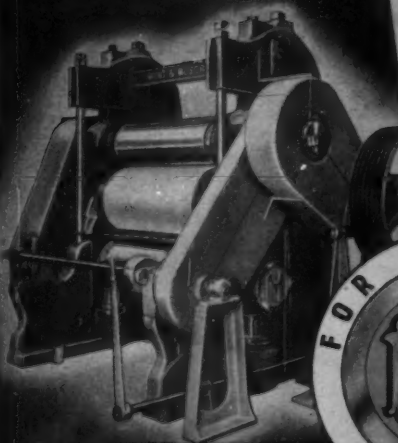


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xi	T Saville Whittle Ltd
ix	Shell Chemical Co Ltd
xxxiv	Shirley Developments Ltd
xxi	F Smith & Co (Whitworth) Ltd
iv	Standard Chemical Co
xxxvii	Staveley Iron & Chemical Co Ltd
xxxix	Tennants Textile Colours Ltd
xxxi	W P Thompson & Co
xxviii	Town End Chemical Works Ltd
xix	Vinyl Products Ltd
xxxiv	J B Wilkinson (Chemicals) Ltd
xx	Yorkshire Dyeware & Chemical Co Ltd

